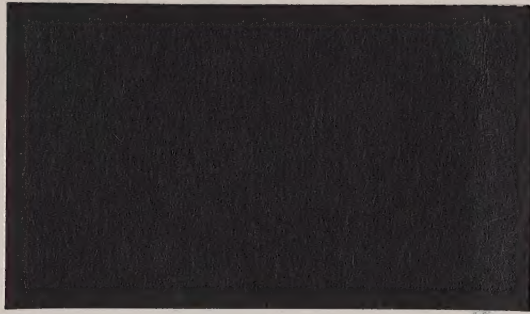




datum inc.

Timing Instrumentation





INSTRUCTION MANUAL

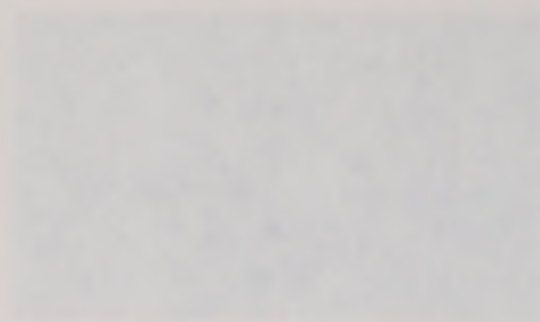
MODEL 9300A

TIME CODE

GENERATOR/TRANSLATOR

PART NUMBER 9300-722

S/N 4130 AND SUBSEQUENT



ADDENDUM

In addition to the basic 9300 Time Code Generator/Translator, the 9300-722 contains the following option:

1. SLOW CODE (Seconds, Minutes, Hours, Days)
 - a. See Drawing Number 15298 for Logic.
 - b. See Section II for specifications and Pin Assignments.
 - c. See Page IV-1 and III-3 for Adjustment and Operation.

TABLE 1
PIN ASSIGNMENTS

J4 Parallel Outputs (Binary Coded Decimal)

<u>Pin</u>	<u>Term</u>	<u>Pin</u>	<u>Term</u>
1	mS1	26	M40
2	mS2	27	H1
3	mS4	28	H2
4	mS8	29	H4
5	mS10	30	H8
6	mS20	31	H10
7	mS40	32	H20
8	mS80	33	D1
9	mS100	34	D2
10	mS200	35	D4
11	mS400	36	D8
12	mS800	37	D10
13	S1	38	D20
14	S2	39	D40
15	S4	40	D80
16	S8	41	D100
17	S10	42	D200
18	S20	43	D400
19	S40	44	D800
20	M1	45	FWD*
21	M2	46	FRP
22	M4	47	GO
23	M8	48	<u>SAMPLE TIME</u>
24	M10	49	<u>SEARCH</u>
25	M20	50	GROUND

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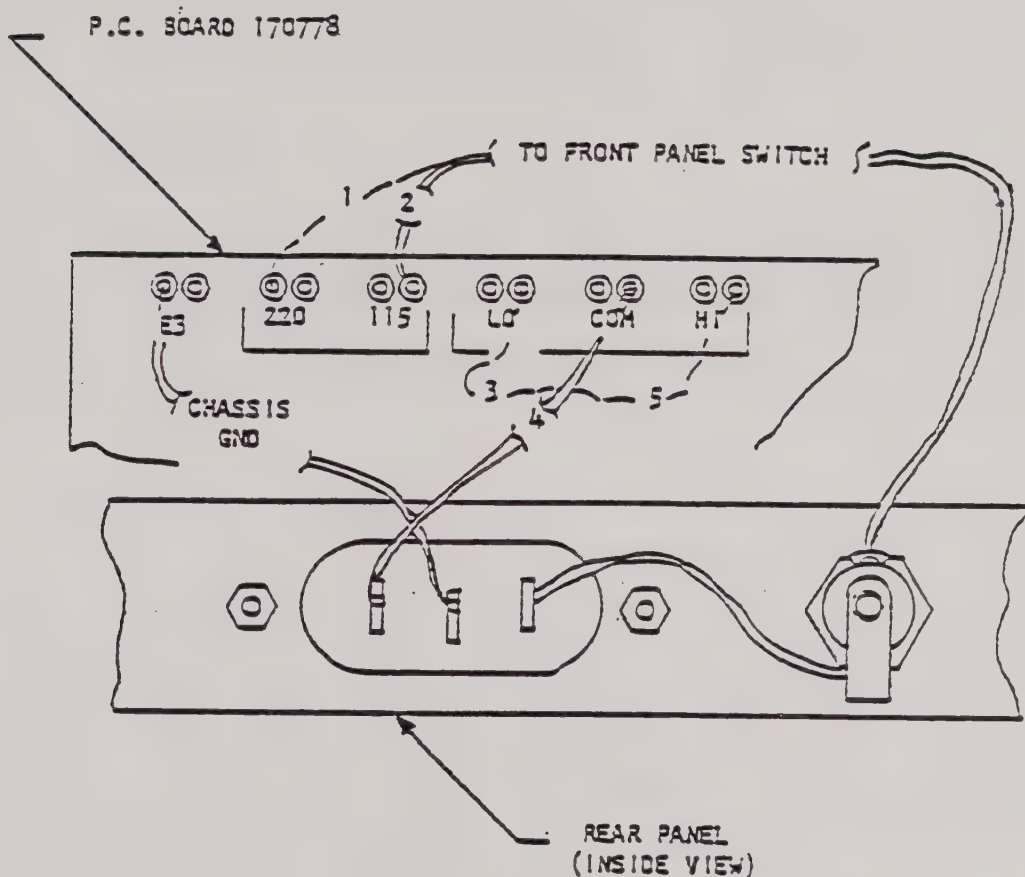
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NOTE:

The Model 9300 is shipped for use with 115V AC operation unless identified for 220/230 VAC at AC power connector. See next page for changes to 220 VAC operation.



1. Jumper #1 For 220 VAC Operation
2. Jumper #2 For 115 VAC Operation
3. Jumper #3 For Lo Line Voltage
4. Jumper #4 For Normal Line Voltage
5. Jumper #5 For Hi Line Voltage

SECTION I

SYSTEM DESCRIPTION

1.1 INTRODUCTION

The Model 9300 Time Code Generator/Translator is designed to perform two basic functions. First, the unit generates a time code in suitable form for recording on magnetic tapes or paper charts. Secondly, the unit is capable of reading the recorded time when played back from a magnetic tape or other sources. The standard format includes BCD seconds, minutes, hours and days only in both the generator and translator modes.

1.2 TIME CODE GENERATOR

As a Time Code Generator the Model 9300 develops a serial, coded time code, modulated to allow recording on magnetic tape or to allow convenient distribution to remote users. The IRIG B is used so that the unit is compatible with many other existing facilities or other standard instrumentation equipment. The standard format is modified to include BCD seconds, minutes, hours and days only. Front panel controls allow the clock to be stopped, started or preset. Each digit of seconds, minutes, hours and days is settable to allow time-of-day or elapsed time operation. The basic clock accumulates time on a 24-hour basis and is accurately updated each second.

1.3 TIME CODE TRANSLATOR

When placed in the translate mode the unit will accept the standard IRIG B format either as generated in the Time Code Generator mode or as received from other sources. By using the standard IRIG Format B, the translator is usable in conjunction with other systems or projects. The unit automatically decodes the serial input code and provides a front panel display, serial pulse trains and optional digital outputs. Reading accuracy is better than 50 microseconds when reading in the forward playback mode.

A synchronization mode, selectable from the front panel, provides noise rejection. This feature allows the selection of "zero", "one", "two", "four", "eight", or "infinite" time frames bypass if input errors are detected. This feature is most important when digital outputs are required, or tape search operation is desired. With "zero" selected each time frame is read. With one, two, four or eight selected, the unit is resynchronized only after

the selected number of consecutive errored frames. With "infinite" selected, the unit updates from the carrier only and disregards the coded information. The unit must be synchronized in one of the other bypass positions prior to selecting the "infinite" mode.

1.4 PHYSICAL

The Model 9300 is constructed in a 1-3/4" package, requiring minimum 19" rack mounting or offering easy handling for desk mounting. A decimal display located on the front panel, shows either generated time or translated time depending on mode of operation. All operating mode controls are mounted on the front panel. Each display digit is individually presettable with a single thumbwheel switch and a pushbutton for each digit.

The circuitry of the Model 9300 consists of TTL type integrated circuits. Each element is mounted in a modular socket for ease in maintainability.

SECTION II

SPECIFICATIONS

2.1 INPUTS

2.1.1 J6 POWER

- a. 115/230 VAC +10%
- b. 48 to 420 Hz

2.1.2 J1 CODE INPUT

- a. Format: IRIG B BCD Time of Year (B122). (Control functions and straight binary seconds may be included in the code but are not recognized as valid data in the standard instrument.)
- b. Modulation Frequency: 1 kHz
- c. Modulation Ratio: 2:1 to 6:
Amplitude: 100 MV p-p to 10V p-p on the mark pulse.
- e. Input Z: 100 K ohm (minimum)
- f. Frequency Range: 10 Hz - 300 kHz
- g. Synchronization Accuracy: Less than +50 microseconds

2.2 OUTPUTS

2.2.1 J2 IRIG B (BCD Time of Year B122)

NOTE: This output is only available when operating in the GEN mode.

- a. Carrier Frequency: 1 kHz sinewave
- b. Amplitude: Adjustable from 0 to 10V p-p on the mark pulse.
- c. Modulation Ratio: Adjustable from 2:1 through 4:1
- d. External Load: 600 ohms

2.2.2 J3 STANDARD PULSE RATES

- a. Rates:
 - 1K pps Pin 1
 - 100 pps Pin 2
 - 10 pps Pin 3
 - 1 pps Pin 4
 - GND Pin 6
- b. Duty Cycle: 80/20%
- c. 1K pps: 50/50% (In Translate Mode)
- d. On Time Edge: Negative
- e. Output Levels: Logic "0" $\approx 0.4VDC$
Logic "1" $\approx 2.4VDC$
- f. Source Impedance: DTL/TTL Compatible

2.2.3 PARALLEL OUTPUTS (Optional)

- a. (J4) 44 bit BCD time of year (milliseconds, S, M, H, D)
- b. (J5) 32 bit time of year (S, M, H, D)
- c. Output Levels: Logic "0" $\approx 0.4VDC$
Logic "1" $\approx 2.4VDC$
- d. Source Impedance: DTL/TTL Compatible
- e. Sample Time: Approximately 1.5 usec pulse to a logic "0" at update time (data is changing during pulse time). Sample time rate is normally 1 pps or 1 kpps (seconds or milliseconds output resolution).

2.2.4 J3 - BI-LEVEL FIVE RATE SLOW CODE (Optional)

- a. Format: DATUM Slow Code
- b. Amplitude: Adjustable - 10V (maximum) on the "mark" pulse.
- c. Source Impedance: 100 ohms
- d. Pin 5 - CODE
Pin 6 - GND

2.3 TIME BASE

- a. Type: Crystal Controlled Oscillator
- b. Frequency: 1 MHz
- c. Stability: $\pm 5 \times 10^{-6}$

2.4 ENVIRONMENT

- a. Temperature: 0°C to +50°C
- b. Humidity: Up to 95% relative

2.5 PHYSICAL

- a. Panel Height: 1-3/4 inches
- b. Chassis Width: 17 inches
- c. Chassis Depth: 18 inches

SECTION III OPERATING PROCEDURE

3.1 GENERATE MODE

- a. Apply 115V AC power to J6.
- b. Turn on instrument by moving the PWR switch, located on the front panel, to the ON position.
- c. Rotate the MODE switch to the HOLD position. (Display should be stationary.)
- d. Preset the time of day using the following procedure:
 1. Start with the least significant digit (unit seconds) and in progression finish with hundreds of days.
 2. Select the number to be preset into each decade with the PRESET thumbwheel switch.
 3. Press the pushbutton under each decade to enter the PRESET number into the output register.
- e. Rotate the MODE switch to the GEN position. At the preset start time, press the START pushbutton.
- f. The display will now update at 1 pps rate and all outputs will be available on their respective output connectors.

3.2 TRANSLATE MODE

- a. Apply power as in steps a and b of the GENERATE MODE procedure.
- b. Connect a standard 1 kHz modulated IRIG B code to BNC connector J1 located on the rear of the unit. It does not matter if the code format has been modified to remove the control functions or straight binary seconds, as this portion of the time code is not used for decoding purposes in the 9300. (See 9300 Input Specifications for modulation ratio, frequency range and amplitude requirements.)
- c. Rotate the MODE switch to the TRANS position.
- d. Place the FWD/REV switch to the FWD position.
- e. After allowing approximately one minute after turn-on for the AGC to settle, the 9300 will automatically synchronize to the input time code.

3.3 BYPASS OPERATION (See also paragraph 3.12)

- a. Select TRANS. The 9300 will respond to each time frame of the input code. Any degradation of the input code may cause an erroneous reading on the 9300 Time Code Generator/Reader.
- b. Select 4. The 9300 will sync to the input code, then automatically lock out its own sync circuits and just monitor the input code for time differences. Frame errors are counted; however, the 9300 synchronization is not disturbed unless four consecutive errored frames are counted. If frame errors are separated by a valid frame, the error counter is reset to zero. Therefore, resynchronization can only take place on the fifth frame after counting four consecutive errored frames. This mode can be extremely useful when the input time code is noisy or being derived from a poor or spliced tape.
- c. oo BYPASS. NOTE: Prior to selecting this position, the 9300 must be synchronized in either the TRANS, 1, 2, 4, or 8 position. After synchronization, rotate the MODE switch to the oo (infinite) Bypass position. Once in this mode, all synchronizing functions are locked out, and the 9300 will act as an elapsed time generator updating on the carrier rate of the input code.

3.4 DIRECTION CONTROL

The 9300 is provided with manual direction control and is operated by means of a front panel toggle switch, INPUT FWD/REV. For forward operation place this switch in the FWD position. For reverse translation, place the switch in the REV direction.

3.5 INPUT CODE POLARITY CONTROL

The 9300 includes provisions to compensate for inverted polarity input codes. This is done with a front panel toggle switch, INPUT +/-. For normal operation, this switch should be placed in the (+) position. For inverted polarity input codes, place the switch in the (-) position.

3.6 INTERNAL FILTER CONTROL

An internal 3 kHz low pass filter has been provided in the 9300, for use in playback (X1 speed ratio) operation. To activate this filter, place the front panel FILTER IN/OUT switch to the IN position.

3.7 TAPE SEARCH OPERATION (Optional)

- a. Connect the 9300 to the Tape Search unit as described in the Tape Search unit instruction manual.
- b. Insure that the FWD/REV switch is in the FWD position and that the FILTER switch is in the IN position.
- c. A logic "1" on Pin 45 of J4 will program the 9300 for forward operation, a logic "0", for reverse operation.
- d. A logic "1" on Pin 49 of J4 will activate the low pass filter, a logic "0" will de-activate the filter.
- e. A logic "0" Pin 47 of J4 will inhibit updating of the 9300.

NOTE

When connected to the Tape Search Unit and playback speeds of greater than 1:1 are desired, disconnect P4 Pin 49 (SEARCH) in the Tape Search Cable and set the 9300 front panel FILTER switch to the OUT position (see paragraph 3.6).

3.8 5 RATE SLOW CODE (Optional)

The PRESET thumbwheel switch serves a dual function when the Slow Code option is installed. In addition to serving in the PRESET function, positions "1" through "5" select the desired frame period (see Slow Code drawing in Section Five). Position "0" de-activates the Slow Code circuitry.

3.9 INPUT CODE SELECT (Optional)

Rotate the MODE A/B/E switch to program the 9300 to accept either IRIG A, IRIG B or IRIG E as the input code.

3.10 ADVANCE/RETARD (Optional)

- a. Preset and start the generator as described in paragraph 3.1 above.
- b. Sync an oscilloscope on the "on-time" edge of an external reference pulse (1 PPS).

- c. Observe the "on-time" edge of the equivalent 9300 local pulse rate. If the local pulse appears to the right of the external reference, the 9300 is "late". If the local pulse occurs to the left, the 9300 is "early".
- d. Select the greatest Advance/Retard rate (refer to the SWITCH & CONTROL LOGIC (11) drawing for rate identification) which will not overcorrect for the offset in one second. For example: for an offset of 5 milliseconds, the proper rate would be 1 millisecond/second, as 10 milliseconds/sec would overcorrect.
- e. If the local pulse is "early", press the RET pushbutton. If the local pulse is "late", press the ADV pushbutton. Observe that the local pulse appears to move toward the reference pulse.
- f. When the local pulse is within one second correction capability, select the next slowest correction rate.
- g. Continue in this manner until the local pulse is aligned to within the maximum resolution of the Advance/Retard circuit.

3.11 EXTERNAL START (Optional)

- a. Connect the external start pulse (1 PPS) to the INPUT BNC on the front panel. Place the WWV/DC switch in the appropriate position in accordance with the type signal to be used. Observe that the TICK indicator blinks at a 1 PPS rate.
- b. If a WWV "tick" is being used, rotate the LEVEL control to the maximum counter-clockwise position. Adjust this potentiometer clockwise to obtain a steady blinking of the TICK indicator. Setting the control more clockwise than required to obtain a reliable indication may result in an unreliable start.
- c. Preset the generator as described in steps 3.1. Rotate the MODE switch to the GEN position.
- d. After the "tick" which occurs one second prior to the preset start time, press the ARM pushbutton. The ARMED indicator will light.
- e. The next "Tick Pulse" will start the generator.

3.12 DETAILED BYPASS OPERATION

When this switch is set to "0" (TRANSLATE), the instrument monitors the input code and responds to each time frame of the input code. If the input code is erroneous, the unit outputs the incorrect value on both the visual display and any optional outputs. However, the ERROR indicator is enabled (because a difference exists between the input and internal time values). This error status will remain until a subsequent code frame is input which is in agreement with the internal time value.

When this switch is set to "4", the instrument monitors the input code, and if one or more frames are in error (up to 4), continues to properly update the displayed and BCD outputs by utilizing the 1 kHz carrier of the time code. Two (2) conditions affecting the ERROR indicator are as follows:

a. LESS THAN FOUR (4) CONSECUTIVE 'ERRONEOUS' FRAMES:

The ERROR indicator is energized as long as a difference in time value exists between the input code and the internal time registers. At the end of a frame received in agreement with the internal time value, the ERROR indicator is de-energized.

b. FOUR (4) OR MORE CONSECUTIVE 'ERRONEOUS' FRAMES:

The ERROR indicator is energized as long as a difference in time value exists between the input code and the internal time registers. During the fifth consecutive erroneous frame, the time value of the code is entered into the internal time register. If the sixth consecutive frame of the input agrees with the updated time value in the internal time register, the ERROR indicator is de-energized at the end of this frame. However, if the sixth frame of the input code does NOT agree with the updated time value in the internal register, the input code value is again entered into the internal register and the next frame is again examined for agreement with the 'new' time value. The ERROR indicator remains energized and each subsequent frame time value is entered until time value agreement is found.

When the switch is set to "oo" (infinity), the instrument acts simply as an elapsed time generator, updated from its last time value by the carrier input. The ERROR indicator is energized when a difference in time value exists between the input time code and the internal time register and is de-energized at the end of the first frame found to be in agreement. Entering of input code time value(s) is inhibited whenever the switch is in the "oo" position.

Thus, the ERROR indicator is energized whenever a time value difference is detected between the code and the internal time register (irrespective of switch position). Further, this status is de-energized at the end of the first subsequent code frame time value found in agreement with the internal time register. Therefore, the effect of the switch positions is to allow entering (jamming) of the input time code value into the internal time register under the following conditions:

- a. " " - each frame
- b. " " - the frame following a detected 'errored' frame
- c. "2" - the frame following two (2) consecutive detected 'errored' frames
- d. " 8" - the frame following eight (8) consecutive detected 'errored' frames
- f. "oo" - never

From the above examples, it may be discerned that the 'meaning' of the energized state of the ERROR indicator is that a difference in time value exists between the input code time value and the internal register time value, and that the de-energized state of this status means there is no detected difference in these values.

SECTION IV

ADJUSTMENTS

The following is a list of adjustments which are basic to the 9300 Time Code Generator/Translator and includes those assemblies which are basic options. In the case of "Potentiometers", they are set at the factory to a nominal setting as indicated in (). However, the user should refer to the top assembly drawing for the location of these variables and adjust them for his specific requirements.

1. SINEWAVE SHAPER/MODULATOR ASSEMBLY
 - a. R17 Level Adjustment. Range 0 to 10V peak to peak on the mark amplitude of the output code (3V p-p).
 - b. R15 Modulation Ratio Adjustment. Range 2:1 - 4:1 mark to space ratio on the output code (3:1).
 - c. R7 Phase Adjustment. Sets the phase of the carrier frequency so there is no discontinuity when amplitude modulation takes place.
2. POWER SUPPLY ASSEMBLY
 - a. R10 adjusts the output level of the +5 volt regulator. Should be set to +5V $\pm$ 2%.
3. SLOW CODE ASSEMBLY (Optional)
 - a. R12 adjusts the output level (+6V mark amplitude).

SECTION V

THEORY OF OPERATION

5.1 LOGIC DESCRIPTION AND USE

The 9300 is depicted by several drawings. One of these is the Top Assembly drawing which shows the physical location of the assemblies that are contained within the instrument. This print should be used to locate connectors on the rear panel and for quick reference to the physical location of any of the assemblies or controls.

In the title block of each logic print or schematic is a circled number (parenthesis are used in this text). For instance, the IRIG basic print (Minor Time) has circled number (8) in the title block. The IRIG basic print (Major Time) has circled number (9). The LED display has circled (12) in the title block. Except for terms originating within the drawing being studied, this reference number will precede each term, showing the sheet of logic upon which it originated. To use these numbers, simply observe the term, look at the term reference number in front of the term, then select the print that has this reference number in the title block. This print will show the point of origin of the term you are trying to find. This provides a convenient means of getting back and forth from various pages of these logics.

Each time a term reference number will refer you back to the source of that signal. In each of the logics there will be a number such as A4, A8, A11, etc. These numbers refer to the physical location on this assembly for that particular integrated-circuit element. In order to determine the physical location of an integrated circuit, one would merely refer to the top assembly drawing or look at the actual assembly. Each assembly contained within the instrument is shown by part number. Then, by referencing the mechanical top view of the instrument, look for the board labeled with that part number. Examine the board until the desired integrated circuit is located.

All references in this discussion will be based on the circled term reference numbers located in the title blocks of all logic prints. The reader should be familiar with the above before proceeding.

5.2 GENERAL

The Model 9300 is both a time generator and a time translator. A time generator is a device which takes a reference frequency and divides it so as to accumulate or "count" time intervals. A time translator is a device which requires a serial coded input and "decodes", or "translates" this input to some other form, usually parallel time data.

In order to better understand the logic organization of the 9300, let's first review the basic configuration of typical timing units.

Figure 5-1 shows a simplified diagram of a typical Time Code Generator. The significant sections of a Time Code Generator are:

- a. Frequency Source - Usually a crystal-controlled oscillator.
- b. Minor Time Counters - The purpose of these counters is to develop scan terms and rates required to develop the serial code format or to be used for parallel outputs. They also supply a 1pps signal that is used to update the Major Time Accumulator.
- c. Major Time Accumulator - This section is comprised of counters whose function is to store the time-of-year data. It is incremented by the 1 pps clock output of the Minor Time. Its outputs are buffered and used for parallel outputs or they are scanned by the encoder and output in a serial format.
- d. Counter Control - This section synchronizes the time accumulator and includes switches to select and enter the time-of-day into the Major Time Accumulator.
- e. Parallel-to-Serial Converter - This section consists of scan gates that serialize the contents of the accumulator into a continuous pulse train.
- f. Formatter - This section uses pulse rates from the minor time counter to obtain the pulse widths and index pulses required to provide the format defined by the type of time code being generated. This format is then usually combined with a sinewave to provide an amplitude-modulated signal.
- g. Output Amplifier - This section provides the required output drive and signal levels of the formatter output.
- h. Display - This section visually interfaces the generator with the operator.

figure 5-1

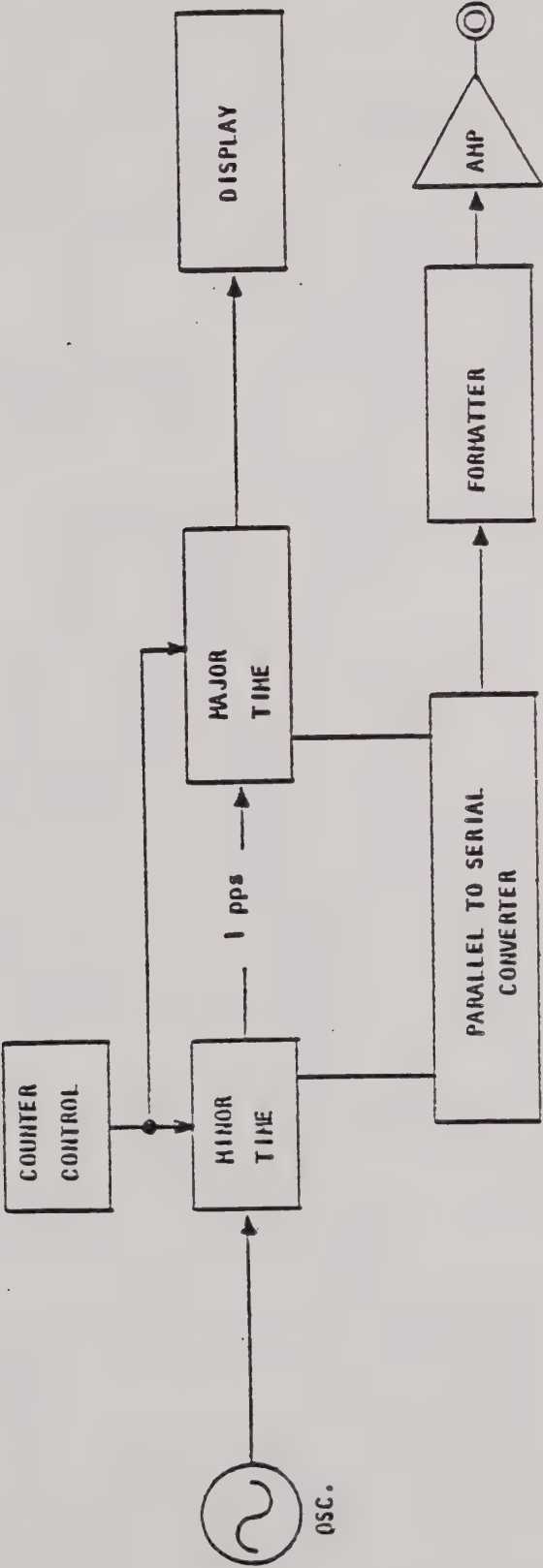


Figure 5-2 shows a simplified diagram of a typical Time Code Translator. The significant points to a Time Translator are:

- a. Input Amplifier - Usually this is an AGC (Automatic Gain Control) type amplifier. Its function is to provide a constant amplitude signal to the decode and detection circuitry.
- b. Serial to Parallel Converter - This is the heart of the unit. Its function is to detect digital data in the input format and assign it to storage in the time accumulator. This portion contains the necessary circuits to synchronize the frequency dividers.
- c. Frequency Dividers - These counters divide the carrier frequency. Once synchronized by the decoding circuitry in the serial-to-parallel section, these counters provides the terms necessary to index the digital data contained in the input code. This allows the locating of each code bit and the proper assignment to accumulator storage. Also important, they provide a 1 pps signal to update the Time Accumulator.
- d. Time Accumulator - These counters store the value being read from the input code. They are updated with the 1 pps signal from the frequency dividers and is permuted to count in the format of the input time code (usually seconds, minutes, and hours). Day-of-year may sometimes be provided if required and is contained in the input time code. The Time Accumulator is the basis for most outputs required by the unit.
- e. Display - This section takes the Time Accumulator data and visually displays it for the user.

Now if we combine the two functions, taking advantage of circuitry found common to both, we obtain a Time Code Generator/Translator (Figure 5-3). Logic functions which are common, i.e., those which need not be duplicated are :

- a. Frequency dividers (all of those in the translator and at least half of those in the generator).
- b. Time Accumulator
- c. Display

Of course, the power supply and chassis are shared.

figure 5-2

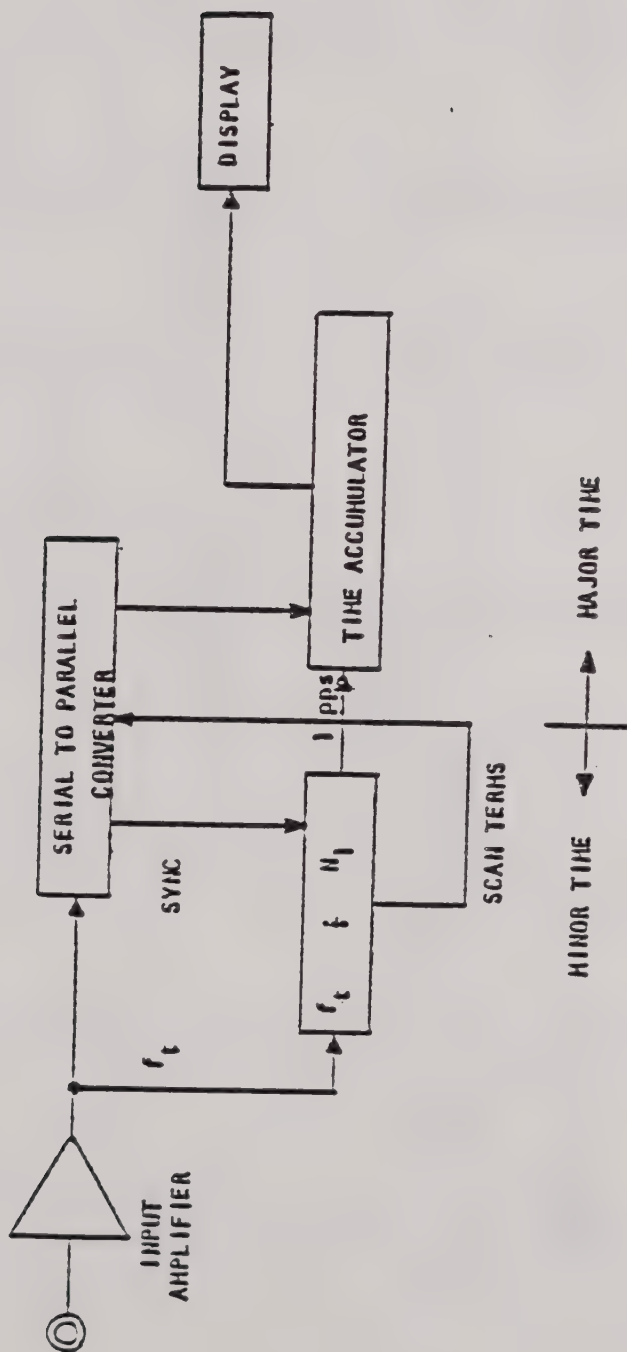
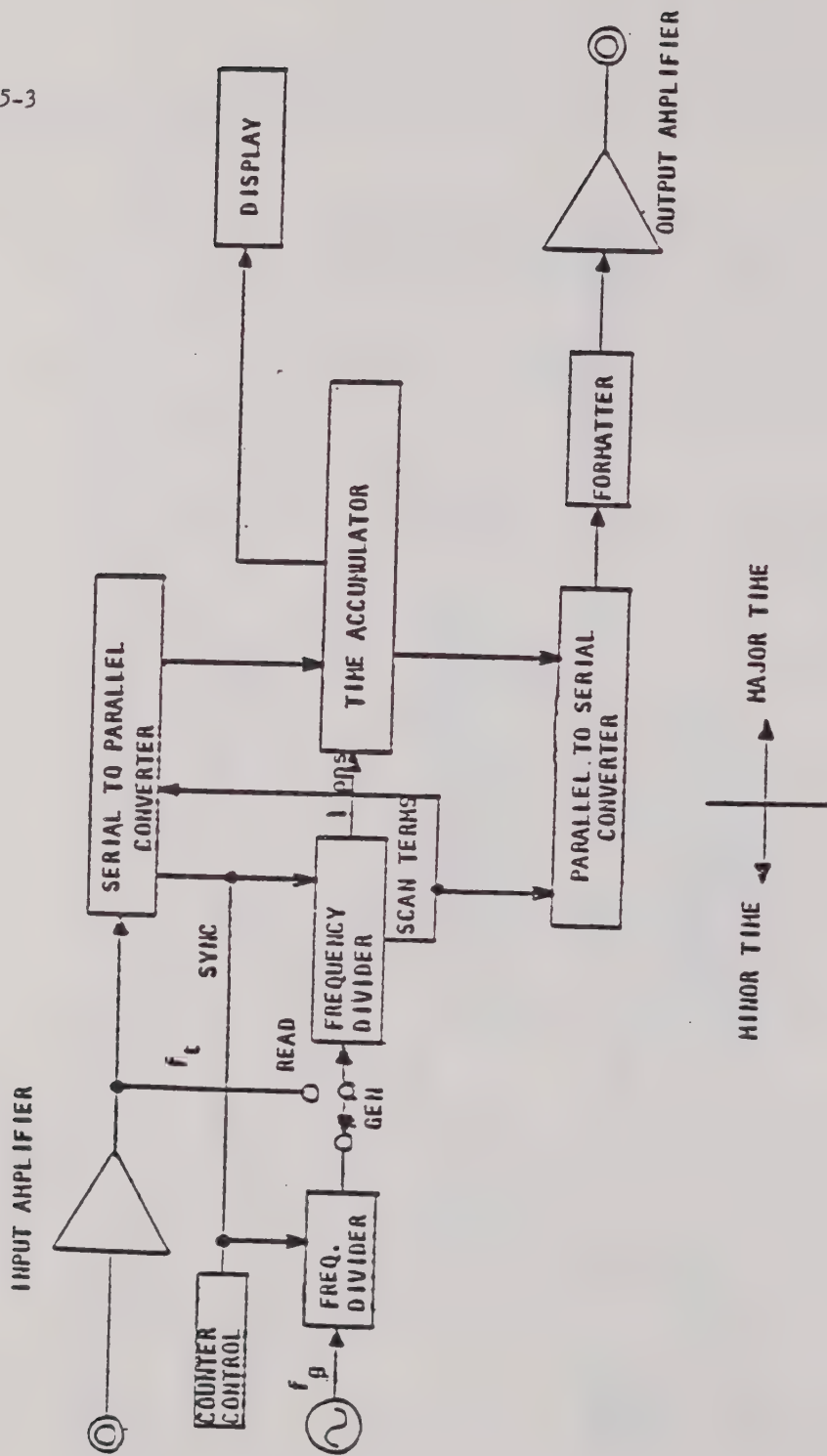


figure 5-3



5.3 DETAILED LOGIC DESCRIPTION

This description will refer only to the term reference numbers that are contained within the title block of each individual logic print. Before proceeding, the reader should be familiar with paragraph 5.1, LOGIC DESCRIPTION AND USE.

(1) AGC

The automatic gain control amplifier assembly contains the input amplifier and the code strippers required to normalize the input and derive the necessary clock signals for the decoder.

The AGC amplifier is wideband so as to make the unit operational where variations of input signal frequency as well as amplitude are experienced such as in tape search applications.

Generally if a translator is used as a single purpose unit such as to only translate code at a single rate and display it, the AGC circuits can be narrowband. To make the unit more adaptable to different types of applications, we have provided a 100 MV to 10 volt input dynamic range and a frequency response of 25 Hz to 300 kHz. The circuit does not require adjustment over this range.

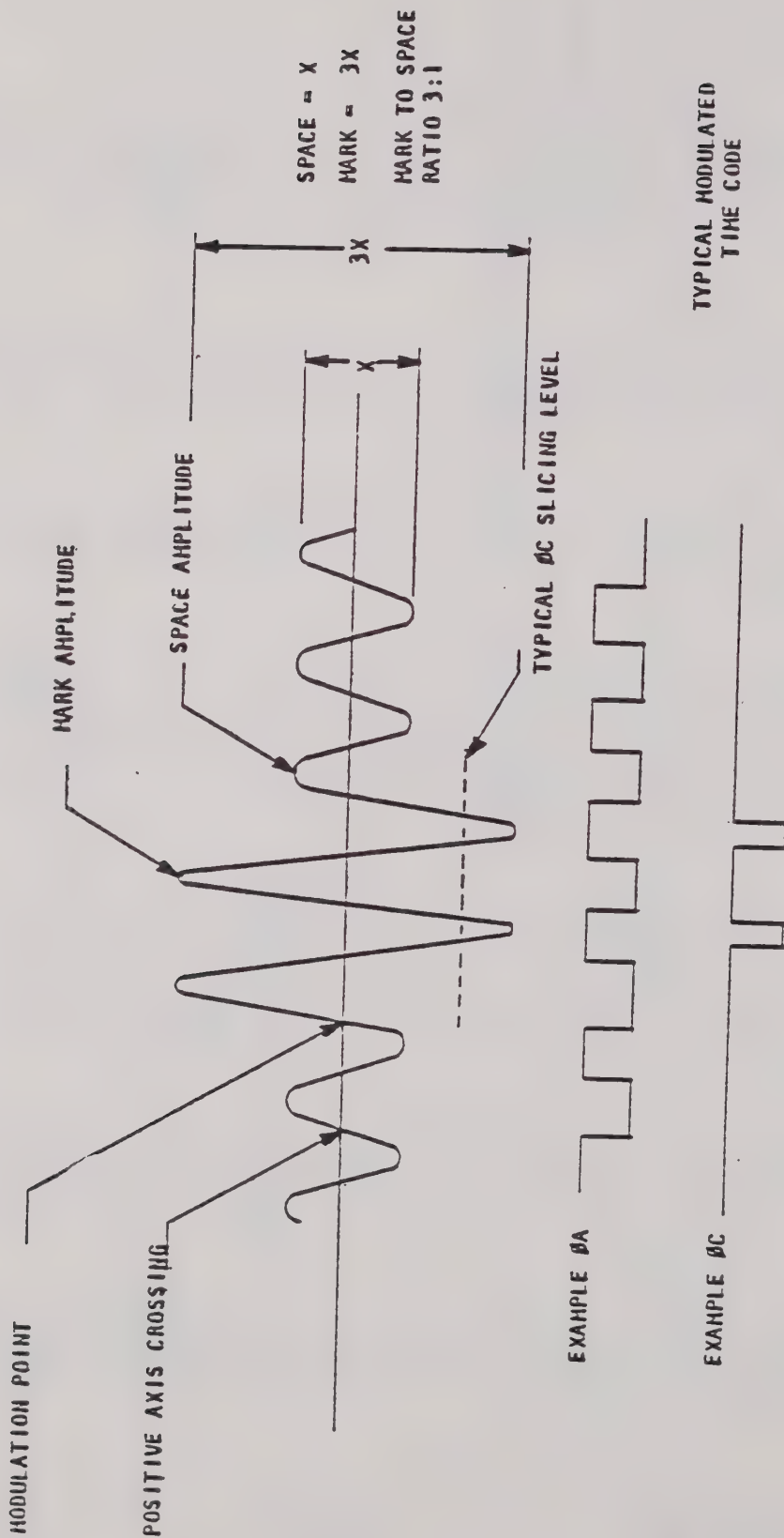
After the input signal is normalized by the AGC, preset level comparators develop clock signals used for decoding. $\emptyset A$ which occurs at the positive zero axis crossing of the carrier, is used throughout the unit for clocking and synchronization. $\emptyset C$ is the mark clock which occurs only each half cycle of the carrier modulation (mark amplitude cycles).

Figure 5-4 shows a typical modulated signal. Two cycles are modulated. Examples of $\emptyset A$ and $\emptyset C$ are shown relative to the signal. Observe also the other definitions provided.

(2) DECODER

This logic uses the terms $\emptyset A$, $\emptyset B$ and $\emptyset C$ from the AGC (1) to reconstruct the D.C. envelope of the input code. This logic symbol is identified as DF3 and represents this reconstructed envelope.

figure 5-4



A binary counter is used to count the number of "mark" cycles that are contained during each positive excursion of DF3. Whenever four or more "mark" cycles are counted, the term BIN1 (Binary 1) will go to a logic "one" indicating the presence of a Binary One in the code. When eight "mark" cycles have been counted, the term PIC (Position Identifier Count) will go to a logic "one". The coincidence of PIC with DF3 being clocked off causes the logic term identified as PID (Position Identifier Detector) to go to a logic "one" indicating the detection of one of the ten position identifiers contained within the IRIG format.

Once per frame, the terms PIC, PID and DF2 coincide. This occurs at plus nine milliseconds in IRIG B and the decoded combination is used to trigger the frame sync one-shot (FS). This pulse is used to sync the minor time milliseconds counter to a count of nine, thus causing the minor time counters to be synchronized with the input time code.

(3) MODE CONTROL

This logic contains the steering logic necessary to program the unit for the generate or translate mode of operation, to condition the unit for forward or reverse translation, and to accept normal or inverted polarity input code.

In the generate mode, the unit is programmed for forward operation. In the translate mode, forward or reverse translation is controlled by the FWD/REV switch on the front panel or via the rear panel (FWD*) if the optional parallel outputs are installed. A front panel switch conditions the unit to accept normal (+) or inverted (-) polarity input codes.

This logic also contains a four-bit serial-to-parallel converter which takes the serial time information (BIN1) from (2) and converts this data to four lines of parallel data (SF1, 2, 4, or 8) in the translate mode. In the generate mode, the contents of the PRESET thumbwheel switch are passed directly through. These outputs are bussed common to the "D" inputs of the major time accumulators on (9). This allows for presetting the desired start time when in the HOLD mode or for loading the BCD time contents from the input code when in the translate mode.

Also contained on this logic is a two-way, four-bit data selector used to select the appropriate clocks for the serial-to-parallel converter (SFS) and the milliseconds counter (CMSC*) as well as two synchronization pulses ($\overline{\text{FS}}$ * and $\overline{\text{GFS}}$ *) in the generate or translate modes of operation. The serial-to-parallel converter is clocked by the 1 MHz

clock (MCC) in the generate mode and by a decoded term from the Decoder (2) in the translate mode. The milliseconds counter is clocked by either tmSC8 in the generate mode or by ØA in the translate mode.

Portions of four logic elements C3, D3, D9 and F9 are cross-gated to form the RUN/HOLD latch. In the generate mode, rotating the MODE switch to the HOLD position causes $\overline{\text{HOLD}}$ to become a logic "0", stopping and resetting the minor time counters and enabling major time preset pushbuttons via the term $\overline{\text{PSE}}$.

An "exclusive-or" element, D8 pins 1, 2, and 3 provides for a low-pass filter in the AGC to be activated by either the front panel FILTER IN/OUT switch (IFSC) or via the rear panel term (SEARCH) from the optional parallel outputs.

(4) SCAN LOGIC

This logic is used to generate the load pulses necessary for strobing the parallel data from the serial-to-parallel converter on (3) into the major time counters (9).

Assignment to the proper group (seconds, minutes, hours or days) is accomplished by logic elements C5 and C7. Assignment to the proper portion of each group is accomplished by logic elements E6 and E7 which generate unit data strobe pulses (UDSF, UDSR) and tens data strobe pulses (TDSF, TDSR) for both forward and reverse operation.

Forward or reverse strobes are selected by logic elements D7. The two load pulses are factored by the one-shot SPG which limits the width of strobe pulses ($\overline{\text{SPA}}$ and $\overline{\text{SPB}}$) to a duration of approximately one microsecond. $\overline{\text{SPG}}$ inhibits the strobes in the generate mode; or, in the translate mode, until the selected number of errored frames (EC8) from sync mode logic (5) are counted.

(5) SYNC MODE

This logic operates as a digital filter to prevent erroneous information from being displayed or from disturbing the various outputs. The output of the IRIG Encoder ($\overline{\text{DCSC}}$) (32) is serially compared with the comparable decoder output ($\overline{\text{DF2}}$). If a discrepancy exists between the two, the error detector flip-flop ECD clocks "on". When ECD is reset at the end of the frame, the error counter element C10 is clocked one time. The setting of the MODE BYPASS switch (1, 2, 4, 8, or oo) determines how many errored frames will be counted before the counter output EC8 goes true.

When this occurs, the error counter clocks are inhibited and the scan logic is enabled, allowing the input data to be loaded into the major time counter and allowing the minor time counter to be re-synchronized via the term $\overline{GFS}$.

If a valid frame (ECD not clocking on) occurs before reaching the selected number of errored frames (EC8 not clocking true), the error counter is reset via the term $\overline{REC}$. Therefore, the unit's synchronization will not be disturbed until the selected number of errored frames have been counted.

With the MODE/BYPASS switch in the TRANS position, EC8 is held true continuously, therefore the unit is synchronized each frame. With oo(infinite) selected, the unit is never synchronized to the incoming code and acts as a generator, using the input code carrier as a time base.

The sync mode circuitry is disabled in the generate mode and when operating the reverse direction.

(7) TIME BASE

This logic provides the 1 MHz time base for the generator. Four time bases are available: Two different 1 MHz crystal oscillators, a 10 MHz crystal oscillator and a divide-by-ten element, or an optional external 1 MHz sinewave input with a level converter. The output is a TTL 1 MHz pulse (MCC).

(8) MINOR TIME

This logic consists of a series of decade counting units (DCU's) which accept the 1 MHz clock from (7) and divides it to 100 KPPS (sc8), 10 KPPS (hmsc8), 1 KPPS (tm8), 100 PPS (msc8), 10 PPS (hsc8), and 1 PPS (tsc8). The term $\overline{HOLD}$ prevents the minor time counters from updating and holds each decade reset when in the HOLD mode. Also contained on this logic are four buffers which isolate the four standard pulse rate outputs.

(9) MAJOR TIME

This logic consists of a series of UP/DOWN counters which accept the 1 PPS clock (cUSC) from (8). This clock is divided down to one-pulse-per-minute at B9 pin 6, one-pulse-per-hour at B7 pin 6, one pulse-per-day at B5 pin 2 and one pulse-per-thousand days at B2 pin 7.

The tens-of-seconds counter, B9, is forced to reset at the end of sixty seconds by one-shot RTS which "fires" at a decoded count of sixty ($TSC4 \cdot TSC2$). Similarly, the tens-of-minutes counter, B7, is reset at sixty minutes by RTM and the hours counters B5 and B6 at twenty-four hours by RHC.

Presetting the major time to the desired start time in the HOLD mode or to the contents of the input time code in the translate mode is accomplished by lowering the preset pin 11 of the selected decade to a logic "0". This is done via the pushbuttons beneath the associated digits of the display in the HOLD mode and via the strobe pulses from (4) in the translate mode. When this is done, the selected decade is preset to the state of the four preset lines, SF1, 2, 4, and 8.

(10) DISPLAY DRIVERS

This logic consists of a series of four-to-seven line decoders which converts the four-line BCD output of the major time counter (9) to the seven-line format required by the L.E.D. Display (12).

(11) SWITCH & CONTROL LOGIC

This print serves as an interface drawing used to indicate interconnections between the various assemblies within the unit as well as illustrating the various input and output connectors, with the exception of the parallel outputs which are described in a separate logic description.

(12) LED DISPLAY

This logic consists of nine seven-segment Light Emitting Diode (LED) display units. Each converts the seven-segment outputs from (10) to a visible display for interface to the user.

(32) IRIG B ENCODER

Terms from the minor time counter are used to sequence multiplexer chips A9 through A14. The output of the major time counter is then scanned and grouped into ten bit serial words, X0 through X4. X0 contains the serial time information of units of seconds and tens of seconds.

X1 contains the serial time information of units of minutes and tens of minutes. X2, units hours and tens of hours, X3 unit days and tens of days, and X4, hundreds of days. The terms X0 through X4, are again serially selected bit by bit by means of IC A15 and output as the term $\bar{D}$ on pin 6 of A15. $\bar{D}$ now represents the time of year information in a serial form.

Although the data at this point is serial, it is still not in an IRIG B format. The IRIG B format is generated by the output term DCSC and the collection of gates that control the reset line on pin 4 of A7. DCSC is enabled at a 100 pps rate and clocked true by the 1000 pps clock applied to pin 12 of A7. The reset occurs whenever the enable term of pin 4 at A7 is set to a "one" state. This occurs at 2 milliseconds if neither a position identifier is contained at that particular period or a binary "1" is not present in the code. However, if a binary "1" is present in the serial time information being generated at A15, pin 6, the reset of DCSC is delayed until the count of 5, or 5 milliseconds.

At a 10 pps rate, at a count of 9, the DCSC reset enable is delayed for 8 counts, thus generating an 8 millisecond wide position identifier. Once per second, at T-zero time (at the start of the frame), A7 pin 5 (XOYO) is set true. This generates the frame reference pulse of the IRIG B time code and prevents the first pulse of each frame period from being reset until a count of 8 milliseconds. The output of DCSC is buffered and presented as the DC shift code output.

On (32A) the output of A8 pin 6 is a 1 KC squarewave. The odd harmonics are filtered from the squarewave to generate a sinewave that is modulated by the DC code envelope ($\overline{DCSC}$) by means of FET Q1 and IC A17. The output of A17, pin 1, is attenuated by a potentiometer, R17, which is used to set the level of the IRIG B modulated serial time code. The output amplifier consists of A17, Q2 and Q3 (Q2 and Q3 are optional). The gain is set by resistors R18 and R20 which is a fixed gain of 10. The modulated output is available on E6.

(49) POWER SUPPLY

The Power Supply furnishes regulated $\pm 15V$ DC and $+5V$ DC to the unit. The $\pm 15V$ DC regulators are integrated circuit regulators with internal fault protection. The $+5V$ DC regulator employs an LM305 voltage regulator and is of the switching type.

The LM305 is essentially an operational amplifier with a built-in Zener reference. When the voltage on pin 6 falls a few millivolts below that of the internal reference, Q1 and Q2 are turned on and the voltage on the 5-volt line begins to rise. L1 tries to maintain constant current flow and current begins to flow through CR2. This continues until Q1 and Q2 are again turned on and the cycle is repeated.

The switching regulator is thus an efficient method of obtaining constant 5V DC from an unregulated source, since power is dissipated in Q1 only when it is on or changing states.

For 5 volts from a 23V source, Q1 is on approximately 25 percent of the time. Q3 and Q4 provide short circuit protection by forcing the regulator to decrease the output voltage when the current through R7 becomes excessive. When the output voltage becomes too high, CR5 conducts and CR6 is turned on. The current limit circuit then shuts down the regulator.

OPTIONS

Described in the following paragraphs are some (but not all) of the options and capabilities which are available. For instance, Control Functions and/or Binary seconds can be encoded and inserted into the serial code formats or translated from the input codes. These particular capabilities, although not listed would most likely be used in conjunction with one or more of the other options.

A-B-E CODE SELECT (13) (OPTION)

The Code Select option is used whenever multi code translation is required. Whenever the option is installed in the unit, a front panel switch allows the operator to select which IRIG code (A, B and/or E) the unit is to translate.

ADVANCE/RETARD (20) (OPTION)

When in the generate mode of operation this assembly, in conjunction with front panel switches, allows the operator to slew the internally generated update clock in order to align it with an external reference signal.

EXTERNAL START (25) (OPTION)

Allows the unit to be started "on time" from an external WWV TICK signal or a DC pulse.

17 BIT BINARY CONVERTER (27) (OPTION)

Provides parallel buffered 17 Bit Binary outputs (seconds, minutes, hours) of the major time counter. 10 bits of Binary milliseconds can also be provided.

SLOW CODE (29) (OPTION)

Converts parallel BCD information (major time), in conjunction with a front panel switch, to a bi-level 5 Rate Serial Slow Code format.

PARALLEL OUTPUTS (30) (OPTION)

Provides parallel buffered BCD outputs of the major and or minor time counter contents. Also provides for other output timing signals and for external control of the Time Code Translator (e.g. Tape Search Control) if required.

IRIG A ENCODER (31) (OPTION)

This option provides for the generation of the IRIG A Time Code Format (A132). The operation of this assembly is essentially the same as for IRIG B (32). However, since the code rate is 1000 PPS the input timing terms are different and the pulse widths mentioned are decreased by a factor of ten.

IRIG E ENCODER (35) (OPTION)

This option provides for the generation of an IRIG E Time Code Format (E112). The operation of this assembly is essentially the same as for IRIG B (32). However, since the code rate is 10 PPS the input timing terms are different and the pulse widths are increased by a factor of ten.

SECTION VI

MAINTENANCE

The 9300 Time Code Generator/Translator utilizes integrated circuits. There are no moving parts or parts with limited life. No periodic maintenance is required if the unit is used under normal conditions. If the instrument is exposed to unusual operating conditions, such as high dust or high humidity environments, or is dropped or otherwise damaged, it may be necessary to perform certain inspection and/or repair procedures.

WARNING

Hazardous voltage levels exist in this equipment when power is applied. Exercise extreme caution when protective covers are removed.

If it is necessary to inspect the unit, the following should be considered:

1. Always disconnect AC power before removing the instrument cover. To remove the cover, simply remove the screw at the rear panel and slide the cover off to the rear.
2. Make a thorough visual inspection of all circuitry and wiring.
3. Check for physical integrity of all components. Look for burned or cracked components, loose physical damage, leakage of insulation compounds or general physical damage. To aid in overall maintenance and repair, each integrated circuit is mounted in an individual modular socket. Removal or replacement is therefore convenient and easy.

It should rarely be necessary to replace an integrated circuit; however, if replacement is attempted, ensure that all component leads enter the socket and that no leads are bent under the component or extended out from the socket.

Check to see that all IC's are firmly mounted in the socket so that good electrical contact is made.

4. Check all switches and connectors for loose or broken wires.
5. If the internal component surfaces and components have an excessive amount of dust deposited on them, use a soft brush and a low pressure stream of air to remove any foreign material.

CAUTION

Do not clean PC boards or small internal components with a stiff brush or solvents since damage to the circuits may result. A high powered vacuum cleaner device should not be used on small internal components.

6. Wipe the external surfaces of the instrument with a soft damp cloth to remove dirt, fingerprints and other foreign material.
7. Replace the cover and reconnect the AC power and input connector. Check operation. If performance does not match or exceed the specifications listed, corrective maintenance is in order.

PRINTED CIRCUIT BOARD REPAIR

Removal and insertion of IC components can be easily made as described above. Should it be necessary to replace conventional components which are soldered to the circuit board, cut the leads of the part near the lead holes. Using a low-power (50 watts or less) soldering iron, apply heat sparingly to each cut lead. As soon as the solder melts, slip the lead from the hole and clean the hole with a tooth pick. Clean the board surfaces with isopropyl alcohol. Form the tinned leads of the replacement part and insert in cleaned holes, trimming the leads to extend 1/16-inch beyond the back surface of the board. Only 63/37 solder with a maximum diameter of 1/16 inch should be used. Solder the leads to the board and use a hemostat, long nosed pliers, or other heat sink on the leads of all semiconductor devices and quarter-watt resistors. Allow the soldered junction to cool before removing the heat sink.

APPENDIX A

TIME CODE FORMATS

The time code formatting data in this Appendix is included for reference purposes only. The actual code either generated or translate by the Model 9300 TCG/T may vary substantially from the formats shown herein, depending on customer specifications.

The Manual Addendum, located immediately behind the title page and entitled "EQUIPMENT CONFIGURATION" defines any deviations from standard formats.

GLOSSARY OF TERMS

ACCURACY (CODE)	The correctness of CODE DIGIT WEIGHTING	POSITION IDENTIFIER	An ELEMENT denoting the position of a portion or all of a CODE WORD
BINARY NUMBER SYSTEM	A number system which uses two symbols, usually denoted by "0" and "1", and has two as its base. Not to be confused with CODE DIGIT WEIGHTING	PULSE	A variation of a quantity whose value is normally constant; the variation is characterized by a "rise" and a "decay" and has a finite "duration"
CODE DIGIT	One of a definite set of ELEMENTS, the set comprising a CODE WORD. Each code digit is individually and numerically weighted	REFERENCE MARKER	A periodic combination of ELEMENTS which establishes that instant of time defined by the CODE WORD
CODE DIGIT WEIGHTING	The numerical value assigned to a particular CODE DIGIT position	SECOND	The basic unit of TIME
CODE WORD (TIME)	A definite set of ELEMENTS which collectively convey information defining an instant of time	TIME INTERVAL	Time interval indicates the duration of a segment of time without reference to when the time interval begins and ends
ELEMENT	One of the parts of which any time signal is composed	STANDARD REFERENCE TIME	The basic repetition rate chosen as the common time reference for all other INSTRUMENTATION TIMING. (usually 1 pps)
FORMAT	The arrangement of ELEMENTS within a group	TIME	Time signifies epoch; that is, the designation of an instant on a selected time scale and is used in the sense of TIME of day
INDEX COUNT	The number which identifies a specific ELEMENT position with respect to a REFERENCE MARKER	TIME CODE ZERO (Tco)	The instant of time defined by all CODE WORDS as zero. It is derived from and coincident with an ELEMENT of the STANDARD REFERENCE TIME
INSTRUMENTATION TIMING	A parameter serving as the fundamental independent variable in terms of which data may be correlated	TIME FRAME	The TIME INTERVAL between consecutive REFERENCE MARKERS containing all ELEMENTS of a time FORMAT.
INDEX MARKERS	Uncoded periodic interpolating ELEMENTS		
ON TIME	The state of any ELEMENT being coincident with the STANDARD REFERENCE TIME		

ABBREVIATIONS

PDM	PULSE DURATION MODULATION	UTC	UNIVERSAL TIME COORDINATED. (The U.S. Naval Observatory is responsible for maintaining the reference for time and time interval for the Department of Defense per OOD Directive 5160 51 1 Feb. 1965.)
PWM	PULSE WIDTH MODULATION	BCD	BINARY CODED DECIMAL
TCW	TIME CODE WORD	CF	CONTROL FUNCTION
TOD	TIME OF DAY	SBS	STRAIGHT BINARY SECONDS
Hz	An abbreviation for HERTZ. The derived unit of frequency (cycles per second).	STOD	SECONDS TIME OF DAY
kHz	KILOHERTZ (1000 HERTZ)	BIT	BINARY DIGIT
ppm	PULSES PER MINUTE	LSB	LEAST SIGNIFICANT BIT
pps	PULSES PER SECOND	MSB	MOST SIGNIFICANT BIT
ms	MILLISECOND (0.001 second)	PAM	PULSE AMPLITUDE MODULATION
μs	MICROSECOND (0.000001 second)	PWC	PULSE WIDTH CODED
fph	FRAMES PER HOUR		
fpm	FRAMES PER MINUTE		
fps	FRAMES PER SECOND		

INTER-RANGE INSTRUMENTATION GROUP STANDARD INSTRUMENTATION TIMING FORMATS

General

In the early 1950s it became apparent that efficient interchange of test data between the various test ranges and contractor, university and Government laboratories would require time code standardization. This task of standardization was assigned to the Tele-Communications Working Group (TCWG) of the IRIG in October of 1956. The original IRIG standards were accepted by the Steering Committee in 1960. IRIG publication No. 104-60 defined the original IRIG Formats. This document was later revised and then reprinted in August, 1970 as Document No. 104-70. More information regarding the efforts of IRIG and the availability of IRIG standards can be gained by contacting the Secretariat, Range Commander's Council, White Sands Missile Range, New Mexico 88002. More detail concerning the individual range synchronization and instrumentation timing can be obtained by referring to IRIG Document 103-59, "Instrumentation Timing Systems" brochure.

Description of Formats

In the IRIG family, individual Time Code Formats are alphabetically designated A, B, D, E, G and H. These are defined in IRIG Document No. 104-70. IRIG C, originally defined in IRIG Document No. 104-60, has been eliminated and effectively replaced by IRIG H. Various signal forms are described in the IRIG Document. Identification numbers have been developed in accordance with the following procedure.

Rate Designation: A) 1000 pps
B) 100 pps
D) 1 ppm
E) 10 pps
G) 10000 pps
H) 1 pps

Form Designation: 0) Pulse, width-coded
1) Sine wave, amplitude-modulated

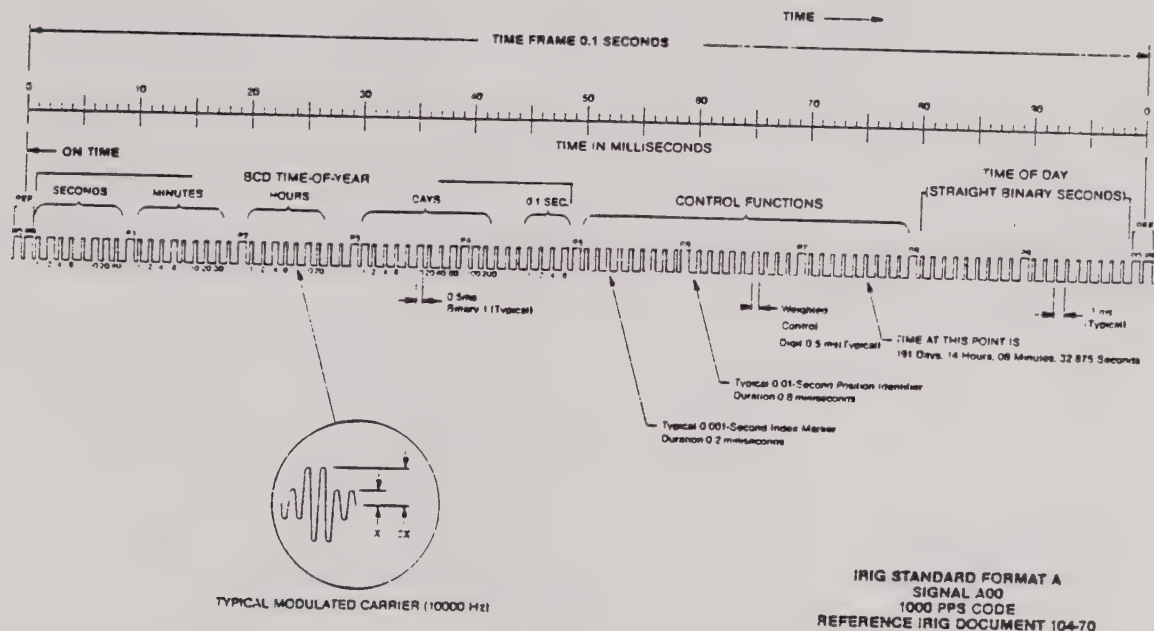
Carrier/Resolution: 0) No carrier/index count interval
1) 100 Hz/10 ms
2) 1000 Hz/1 ms
3) 10000 Hz/0.1 ms
4) 100000 Hz/0.01 ms

Coded Expressions: 0) BCD, CF, SBS
1) BCD, CF
2) BCD
3) BCD, SBS

Only the following signals are recognized to be standard forms in accordance with the IRIG standard:

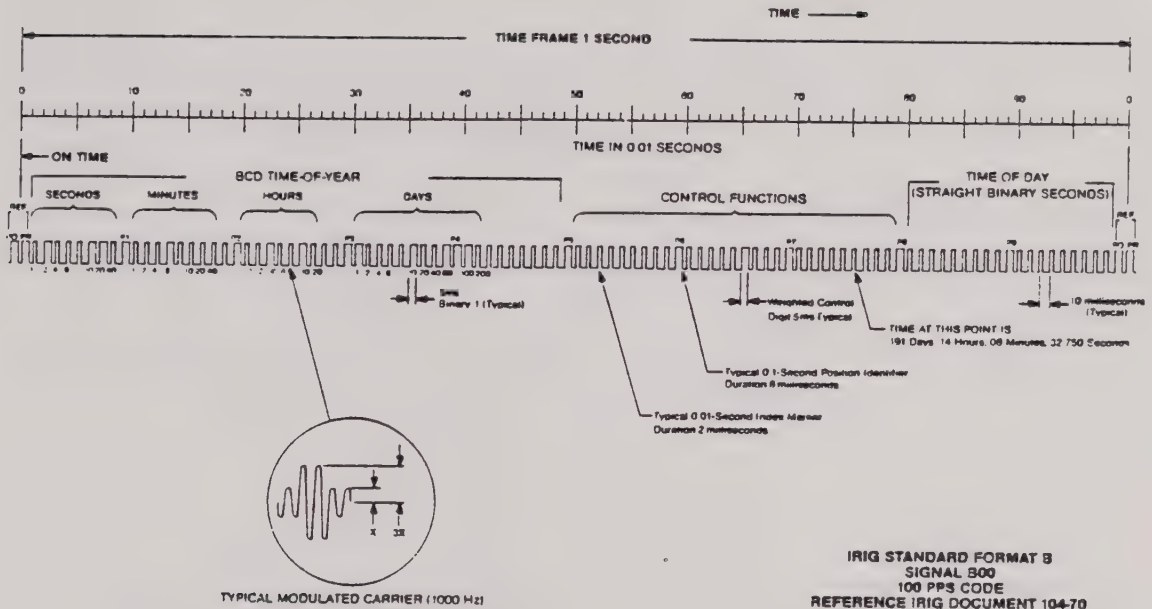
Format A	Format B	Format D	Format E	Format G	Format H
A000	B000	D001	E001	G001	H001
A003	B003	D002	E002	G002	H002
A130	B120	D111	E111	G141	H111
A133	B123	D112	E112	G142	H112
		D121	E121		H121
		D122	E122		H122

IRIG FORMAT 'A' - GENERAL



1. **TIME FRAME:** 0.1 second
2. **CODE DIGIT WEIGHTING OPTIONS:** BCD, SB or both:
 - a. **Binary Coded Decimal Time-of-Year CODE WORD** - 34 binary digits.
 - (1) Seconds, minutes, hours, days and 0.1 seconds. Recycles yearly.
 - b. **Straight Binary Time-of-Day CODE WORD** - 17 binary digits.
 - (1) Seconds only. Recycles each 24 hours. (86399)
3. **CODE WORD STRUCTURE:**
 - a. **BCD.** Word begins at INDEX COUNT 1. Binary-coded elements occur between POSITION IDENTIFIER ELEMENTS (seven for seconds; seven for minutes; six for hours; ten for days; four for 0.1 seconds) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
 - b. **SB.** Word begins at INDEX COUNT 30. Seventeen binary-coded elements occur, with a POSITION IDENTIFIER between the 9th and 10th binary-coded elements.
4. **LEAST SIGNIFICANT DIGIT:** Occurs first, except for fractional seconds information, which occurs following the day-of-year information.
5. **ELEMENT RATES AVAILABLE:**
 - a. 1000 per second (basic Element rate)
 - b. 100 per second (POSITION IDENTIFIER rate)
 - c. 10 per second (Frame rate)
6. **ELEMENT IDENTIFICATION:**
 - a. "On-Time" reference point for each Element is its leading edge.
 - b. **INDEX MARKER** duration: 0.2 milliseconds (Binary Zero or uncoded Element)
 - c. **CODE DIGIT** duration: 0.5 milliseconds (Binary one)
 - d. **POSITION IDENTIFIER**: 0.8 milliseconds
 - e. **REFERENCE MARKER**: Two consecutive POSITION IDENTIFIERS.
(The "on-time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)
7. **RESOLUTION:** 1 millisecond (unmodulated); 0.1 millisecond (modulated)
8. **CARRIER FREQUENCY:** 10 kHz when modulated.

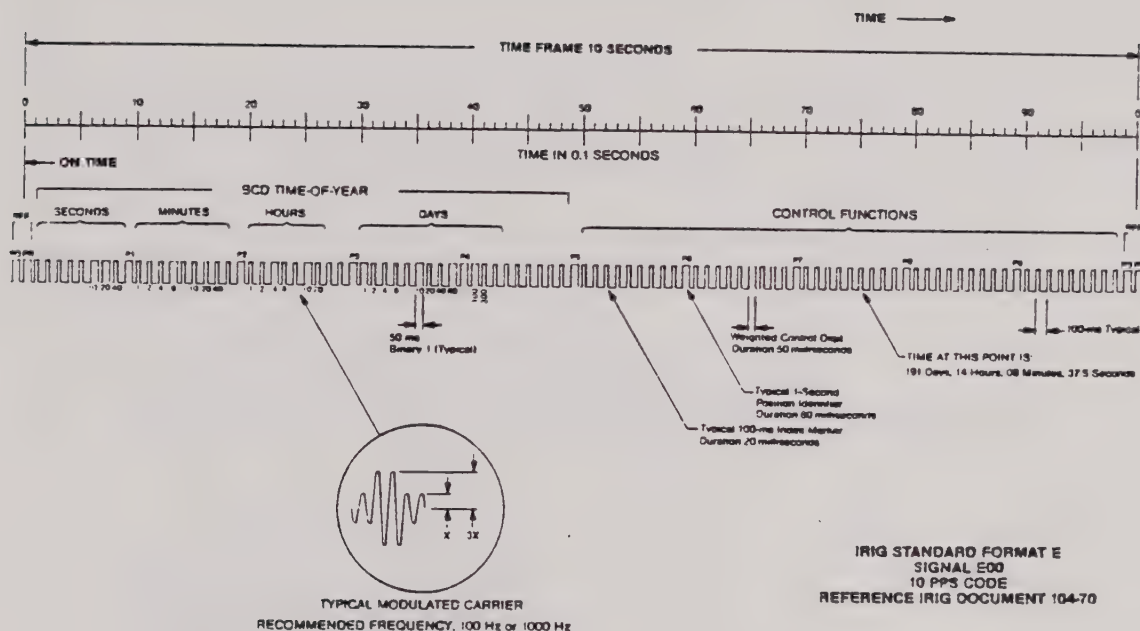
IRIG FORMAT 'B' — GENERAL



1. **TIME FRAME:** 1.0 second.
2. **CODE DIGIT WEIGHTING OPTIONS:** BCD, SB or both:
 - a. Binary Coded Decimal Time-of-Year CODE WORD — 30 binary digits.
 - (1) Seconds, minutes, hours and days. Recycles yearly.
 - b. Straight Binary Time-of-Day CODE WORD — 17 binary digits.
 - (1) Seconds only. Recycles each 24 hours. (86399)
3. **CODE WORD STRUCTURE:**
 - a. **BCD:** Word begins at INDEX COUNT 1. Binary-coded elements occur between POSITION IDENTIFIER ELEMENTS (seven for seconds, seven for minutes; six for hours; ten for days) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
 - b. **SB:** Word begins at INDEX COUNT 80. Seventeen binary-coded elements occur with a POSITION IDENTIFIER between the 9th and 10th binary-coded elements.
4. **LEAST SIGNIFICANT DIGIT:** occurs first.

5. **ELEMENT RATES AVAILABLE:**
 - a. 100 per second (basic Element rate)
 - b. 10 per second (POSITIVE IDENTIFIER Rate)
 - c. 1 per second (Frame Rate)
6. **ELEMENT IDENTIFICATION:**
 - a. "On-Time" reference point for each Element is its leading edge.
 - b. INDEX MARKER duration: 2 milliseconds (Binary zero or uncoded Element)
 - c. CODE DIGIT duration: 5 milliseconds (Binary one)
 - d. POSITION IDENTIFIER duration: 8 milliseconds
 - e. REFERENCE MARKER — one per second: Two consecutive POSITION IDENTIFIERS (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)
7. **RESOLUTION:** 10 milliseconds (unmodulated), 1 millisecond (modulated)
8. **CARRIER FREQUENCY:** 1 kHz when modulated

IRIG FORMAT 'E' - GENERAL



1. TIME FRAME: 10 seconds

2. CODE DIGIT WEIGHTING: BCD: Time-of-Year CODE WORD - 28 Binary Digits. Seconds, minutes, hours and days; recycles yearly

3. CODE WORD STRUCTURE:

BCD: Word begins at INDEX COUNT 8. Binary-coded Elements occur between POSITION IDENTIFIER ELEMENTS (three for seconds, seven for minutes; six for hours, ten for days) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.

4. LEAST SIGNIFICANT DIGIT: Occurs first.

5. ELEMENT RATES AVAILABLE:

- 10 per second (basic Element rate)
- 1 per second (POSITION IDENTIFIER Rate)
- 0.1 per second (Frame Rate)

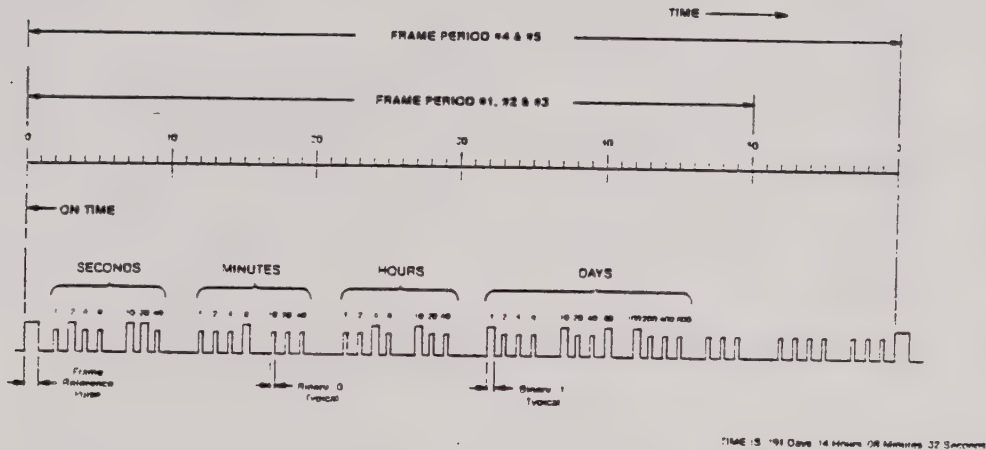
6. ELEMENT IDENTIFICATION:

- "On-Time" reference point for each Element is its leading edge.
- INDEX MARKER duration: 20 milliseconds (Binary zero or uncoded Element)
- CODE DIGIT duration: 50 milliseconds (Binary one)
- POSITION IDENTIFIER duration: 80 milliseconds (Refers to the leading edge of the succeeding Element).
- REFERENCE MARKER (one per 10 seconds): Two consecutive POSITION IDENTIFIERS. (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)

7. RESOLUTION: 100 milliseconds (unmodulated); 1 millisecond (modulated).

8. CARRIER FREQUENCY: 1 kHz or 100 Hz when modulated.

DATUM BI-LEVEL SLOW-CODE (5-Rate Selectable)



TIME IS 191 Days 14 Hours 08 Minutes 37 Seconds

Code	Frame Rate	Frame Period	Binary 0 Space	Binary 1 Pulse	Frame Sync
1	50 Dots	1 Sec	4 ms	0 ms	20 ms
2	10 Dots	5 Sec	20 ms	50 ms	100 ms
3	5 Dots	10 Sec	40 ms	100 ms	200 ms
4	1 Dot	40 Sec	200 ms	500 ms	1000 ms
5	1 or 10s	10 Min	2 sec	1 sec	10 sec

DATUM INC.
BI-LEVEL - 5-RATE
SLOW CODE

The DATUM special Bi-Level Slow-Code is designed to provide a convenient and efficient TIME REFERENCE for strip charts and oscillograph records. Five different and unique codes are provided to enable selection of the desired resolution consistent with the paper speed.

The CODE is width modulated, BCD Format. Amplitude modulation is also added to aid in the separation of the coded information.

Each Code Group is separated by a space to aid in fast recognition of the coded data without loss of resolution or inclusion of extraneous pulses. Coded information represents Time-of-Year in seconds, minutes, hours and days.

SECTION VII
LIST OF DRAWINGS

1. Top Assembly	9300-722
2. AGC (1)	16085
3. IRIG Basic (2)(3)(4)(5)(7)(8)(9)(10)	16543
4. Switch & Control Logic (11)	9300-8125
5. LED Display (12)	16549
6. Slow Code (29)	15298
7. IRIG B Encoder (32)	16062
8. Power Supply (49)	16280

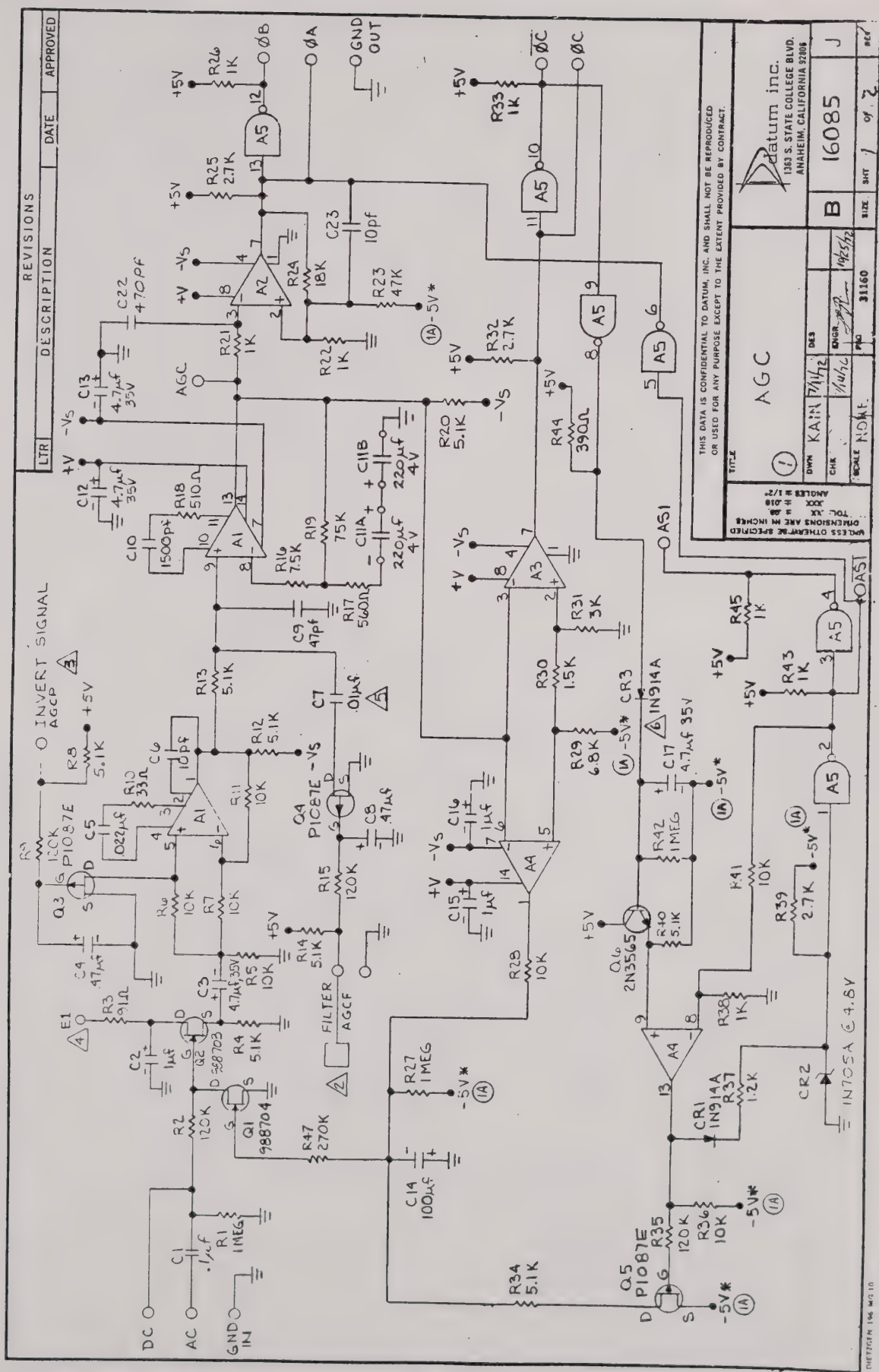
[illegible]

1. TOP COVER REMOVED FOR CLARITY
NOTES: UNLESS OTHERWISE SPECIFIED

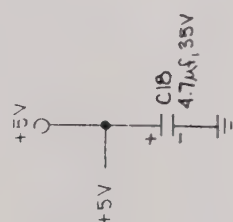
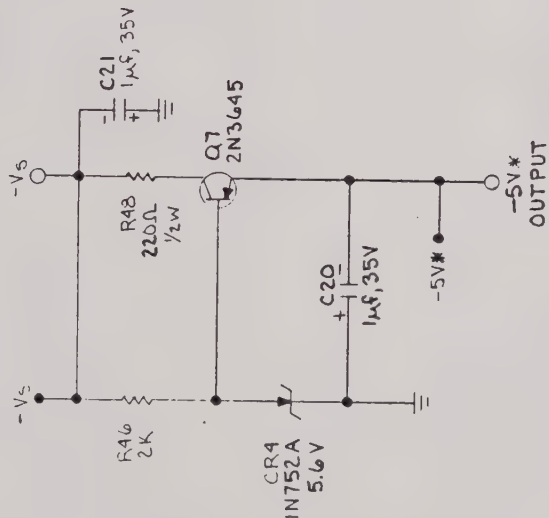
-17.62 (REF)-

THIS DATA IS CONFIDENTIAL TO DATUM, INC AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PERMITTED BY CONTRACT

C 9300-722



REVISIONS		
LTR	DESCRIPTION	DATE
A	ADDED C22	9-27-72
B	ADDED R20 TO SCHEMATIC +E WAS +V _S	1-22-73
C	Q3,4,5 WERE 2N4342	2-13-73
D	ADDED C11A & C11B	7-13-73
E	Q1 WAS 988703	9-12-73
F	C12 & C13 WERE 1μF	9-21-73
G	R3 WAS TO +E, ADDED E1	11-26-73
H	ADDED 	7-7-79
J	ADDED C23 PER ECO T6010	3-31-89
		IC



- 1-2 C17 IS 27nf 10V, R27 IS 4.7M
- 1-1 C1 IS .001μF.
- 1 WIRE TO +15 OR +5V AS REQUIRED
- 1 THIS POINT GROUNDED TO INVERT SIGNAL - REVERSE MODE
- 1 SEE PARALLEL OUTPUT SCHEM FOR PIN NUMBER
- 1 REMOVE FOR REMOTE OR HIGH-SPEED OPERATION

SN7405	NATIONAL	A5
LM749	FAIRCHILD	A1, A4
LM311H	NATIONAL	A2, A3
PART NO	MFR	REF.

THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.

AGC

(1A)

DATE: 7/19/72
CHK: RM
SCALE: NONE

DES: RF
ENGR: gpl
FSC: 14252

DATE: 7/12/72
CHK: RF
SCALE: NONE

DATE: 7/12/72
CHK: RF
SCALE: NONE

31150

SIZE: 2 of 2

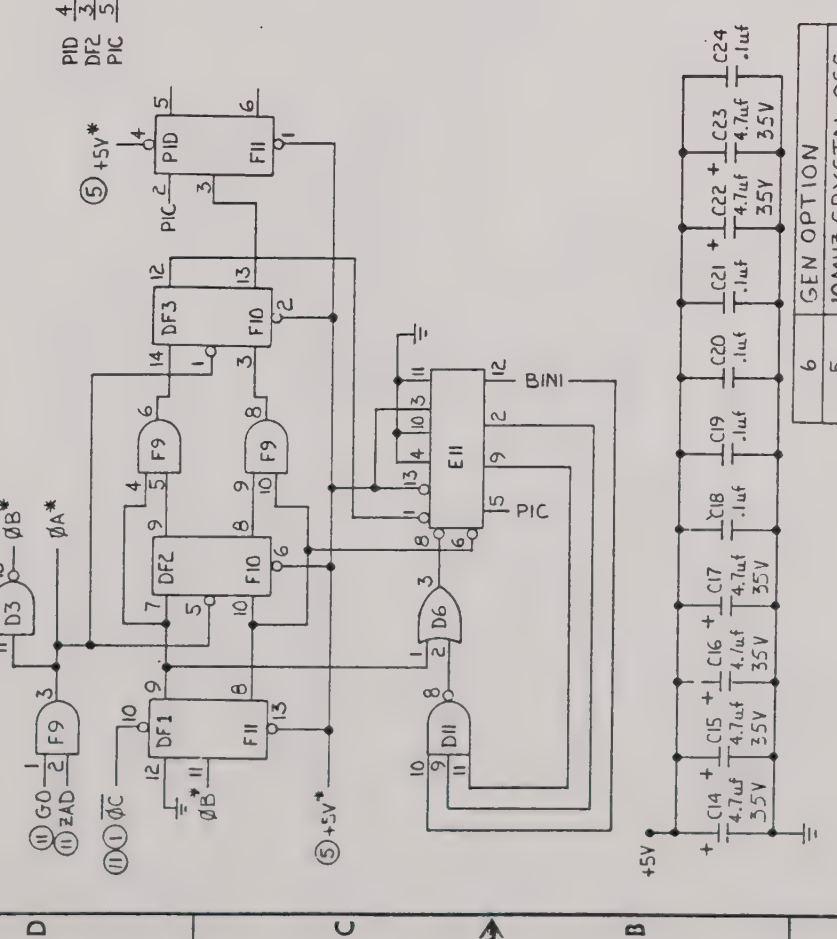
REV: J

Datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92808

5 4 3 2 1

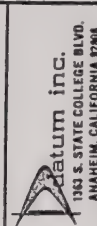
REVISIONS		DATE	APPROVED
LTR	DESCRIPTION		

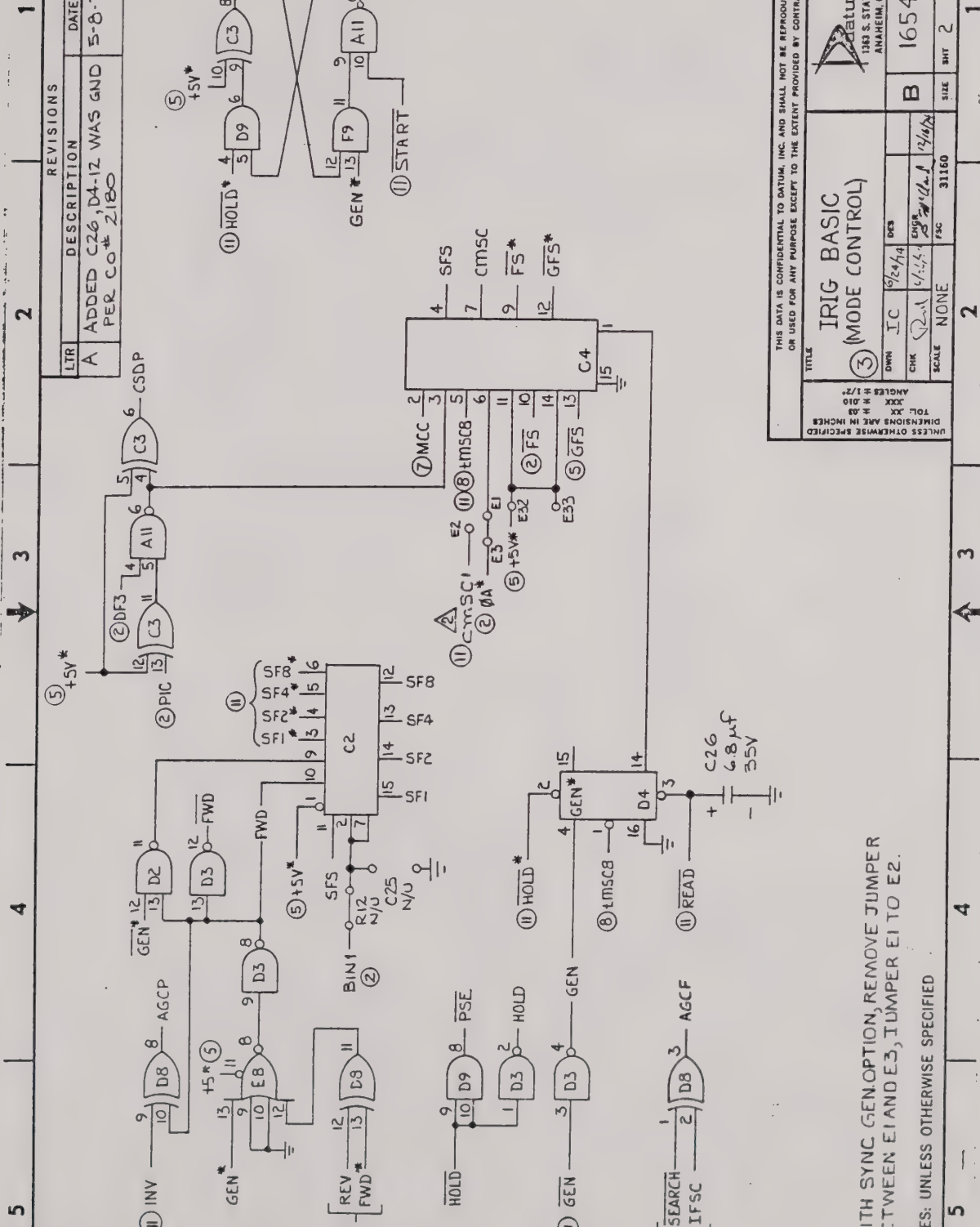
D	899-1-R6K	C6, C8
	LM311D	A1
	MC12061P	D1
	9374DC	AZ-A10
	SN74177N	74LS197 C10, E11
	SN74176N	74LS196 E5, F4-F7, C1
	N7486A	74LS86 C3, D8
	N7473A	74LS73 E10
	N7442B	74LS42 E6
	SN7432N	74LS32 D6
C	N7411A	74LS11 C9
	N7410A	74LS10 D11
	N7408A	74LS08 D9, F8, F9
	N7404A	74LS04 D3
	N7400A	74LS00 D2, D10, A11
	SN7415GN	C5, C7
	SN7474N	74LS74 E9, F11
	SN7425N	E8
	SN74194N	74LS194 C2
	SN74192N	74LS192 B2-B10, E4
B	SN74157N	74LS157 C4, D7, E7
	SN74123N	74LS423 D5, B11
	SN74H106N	74LS76 D4
	SN74H103N	74LS73 F10
	SN74122N	74LS122 C11
	DEVICTYPE	-L
	REF DES	-L
	DEVICE TYPE	-L
	REF DES	REF DES
	DEVICTYPE	-L



TITLE		IRIG BASIC (DECODER)	
DATE	REV	DATE	REV
1/24/74	1	1/24/74	1
CHK	ENG	CHK	ENG
SCALE	SCALE	SCALE	SCALE
NONE	NONE	NONE	NONE
31160	31160	31160	31160
SHEET 1 OF 8		SHEET 1 OF 8	

NOTES: UNLESS OTHERWISE SPECIFIED		DASH NO	
GEN OPTION		DESCRIPTION	
6		10MHZ CRYSTAL OSC	
5		C0251 OSC	
4		C0231 OSC	
3		EXT OSC	
2		DAYS	
1		BASIC S-M-H	
---		DESCRIPTION	





REVISIONS		
LTR	DESCRIPTION	DATE
A	ADDED C26, D4-12 WAS GND PER CO# 2180	5-8-75
		APPROVED <i>RM</i>

THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.

TITLE: **IRIG BASIC (MODE CONTROL)**

DATE: **12/1/75**

BY: **16543**

REV: **1**

SIZE: **8 1/2 x 11**

SCALE: **31160**

UNLESS OTHERWISE SPECIFIED

ANGLES: **1/2°**

TOL: **XX**

FIN: **XX**

W: **XX**

D: **XX**

THICKNESS: **XX**

DATE: **12/1/75**

BY: **16543**

REV: **1**

SIZE: **8 1/2 x 11**

SCALE: **31160**

UNLESS OTHERWISE SPECIFIED

ANGLES: **1/2°**

TOL: **XX**

FIN: **XX**

W: **XX**

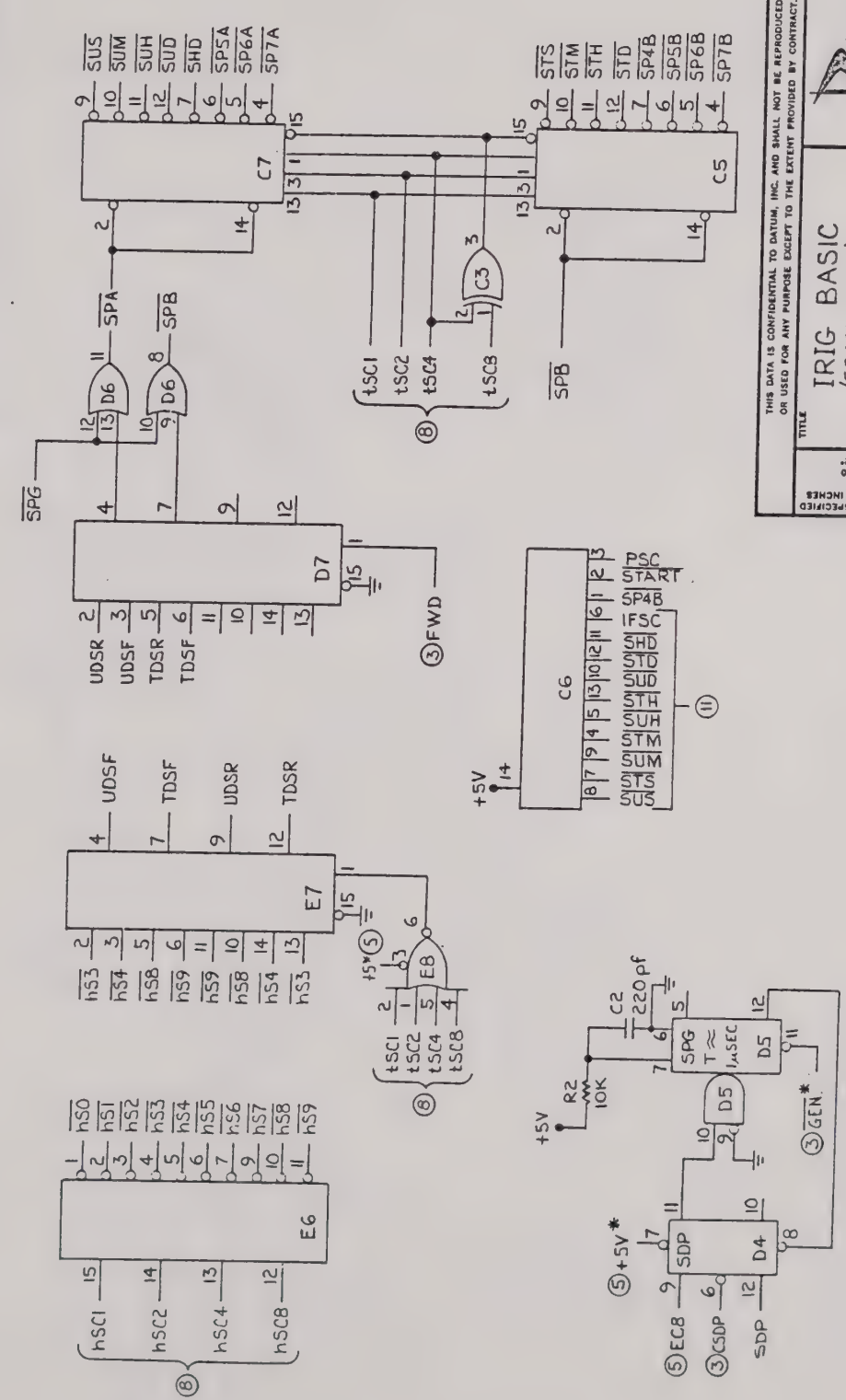
D: **XX**

THICKNESS: **XX**

WITH SYNC GEN. OPTION, REMOVE JUMPER BETWEEN E1 AND E3, JUMPER E1 TO E2.

NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS			DATE	APPROVED
LTR	DESCRIPTION			



THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.

TITLE
IRIG-BASIC (SCAN LOGIC)

DATE
6/24/74

DES
SPG

CHK
Rai

SCALE
NONE

FEC
31160

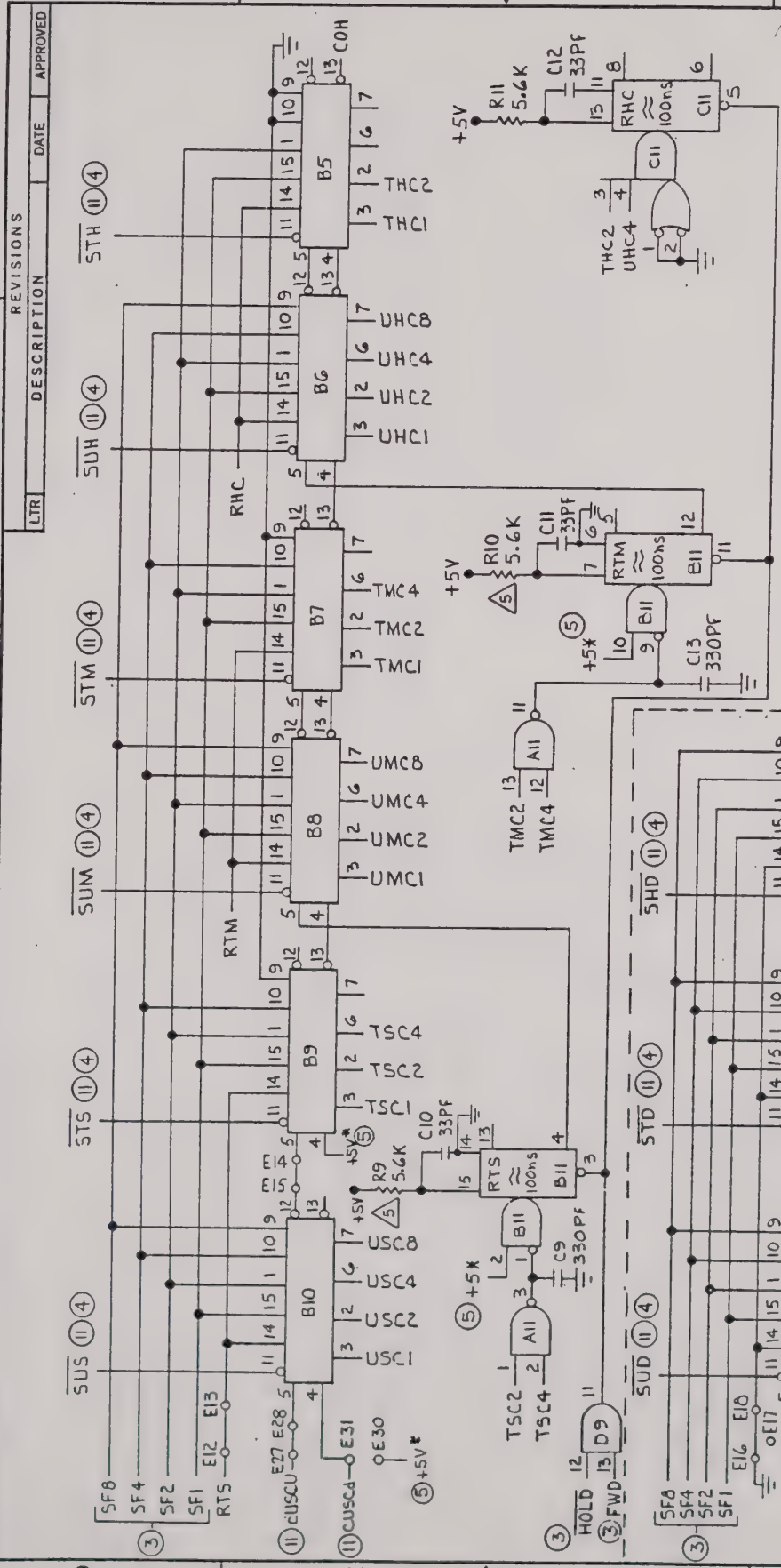
SIZE
3 OF 8

REV
F

DATUM inc.
1310 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS		
LTR	DESCRIPTION	DATE
1		



THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.

IRIG BASIC (MAJOR TIME)

DATE: 6/26/44
 DRAWN: J. L. J.
 CHECKED: J. L. J.
 SCALE: NONE
 SIZE: 31160
 SHEET: 7 OF 8

Datum inc.
 1383 S. STATE COLLEGE BLVD.
 ANAHEIM, CALIFORNIA 92808

IRIG BASIC (MAJOR TIME)

UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN INCHES
 TOL. XX ± 0.10
 XX ± 0.05
 ANGLES ± 1/2°

OWN: MARTINEZ
 CHK: J. L. J.
 DATE: 6/26/44
 BY: J. L. J.

NOTES: UNLESS OTHERWISE SPECIFIED Δ R9 & R10 IS 4.7K IF -L ASSY IS USED.

-L ASSY

REVISIONS		DATE	APPROVED
LTR	DESCRIPTION		

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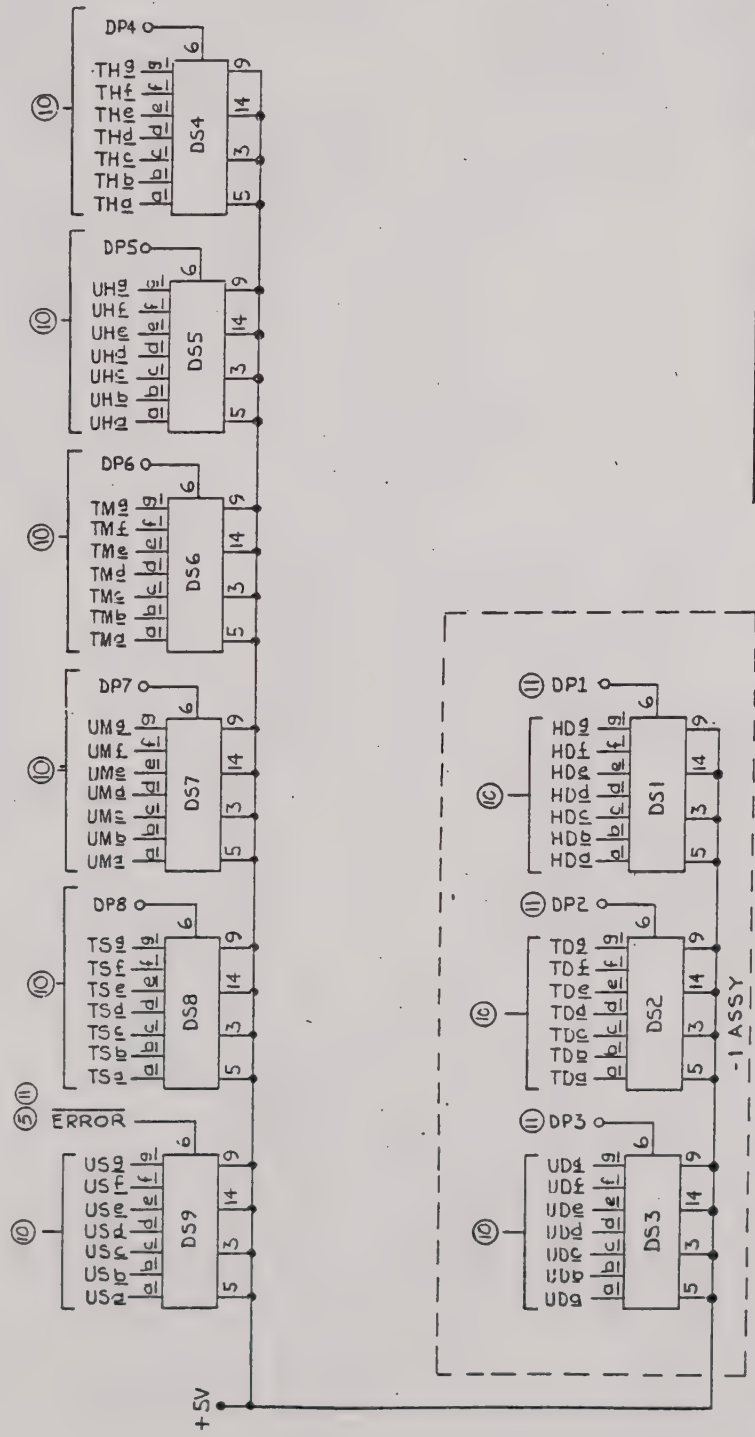
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REVISIONS		
LTR	DESCRIPTION	DATE
-	ADD - 4 f - 5, - 6	10-21-77
		CC/

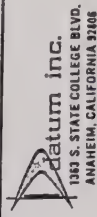


- 5 LEDs ARE YELLOW, H/P 5082-7660
- 4 LEDs ARE GREEN, H/P 5082-7670
- 3 LEDs ARE FAIRCHILD FND-507
- 2 LEDs ARE MONSANTO MANGA
- 1. LEDs ARE H/P 5082-7650

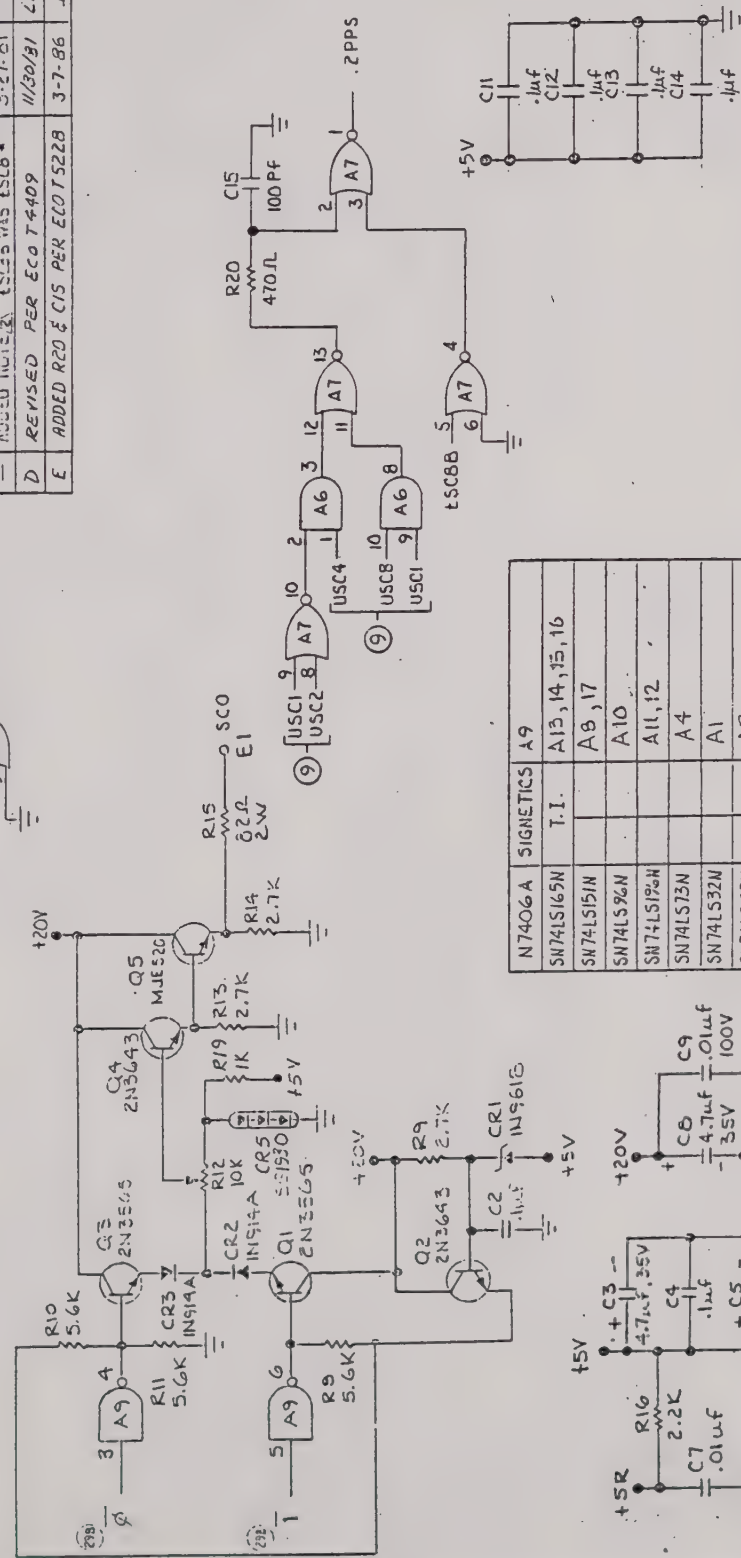
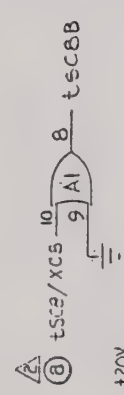
NOTES: UNLESS OTHERWISE SPECIFIED

6 LEDs ARE MONSANTO, 6660

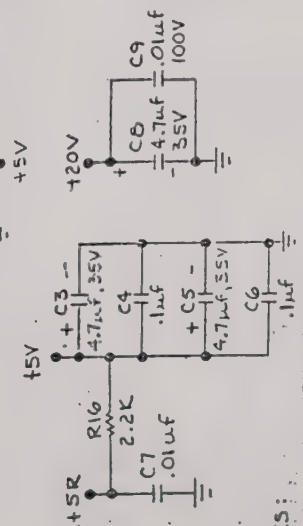
THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.	
TITLE LED DISPLAY	
DRAWN BY IC 6/26/74	
CHECKED BY R 7/2/74	
SCALE NONE	
FIG 31160	
SIZE B	
SHT 1	
REV 1	
PART NO. 16549	
DATE 10/21/77	
APPROVED CC/	



REVISIONS		
REV	DESCRIPTION	DATE
A	ADDED C10 & R17	3-16-71
B	ADDED R18 & CR4	5-10-71
C	ADDED CR5 & R19	9-15-71
D	ADDED NOTE 2 tSCB WAS tSCB *	3-27-81
E	REVISED PER ECO T4409	11/30/81
F	ADDED R20 & C15 PER ECO T5228	3-7-86
G		IC



N7406A	SIGNETICS	A9
SN74LS165N	T.I.	A13, 14, 15, 16
SN74LS151N		A8, 17
SN74LS96N		A10
SN74LS172N		A11, 12
SN74LS73N		A4
SN74LS32N		A1
SN74LS27N		A3
SN74LS08N		A6
SN74LS23N		A5
SN74LS02N		A7
SN74LS00N	T.I.	A2
PART NO	MFR	REF. DES.



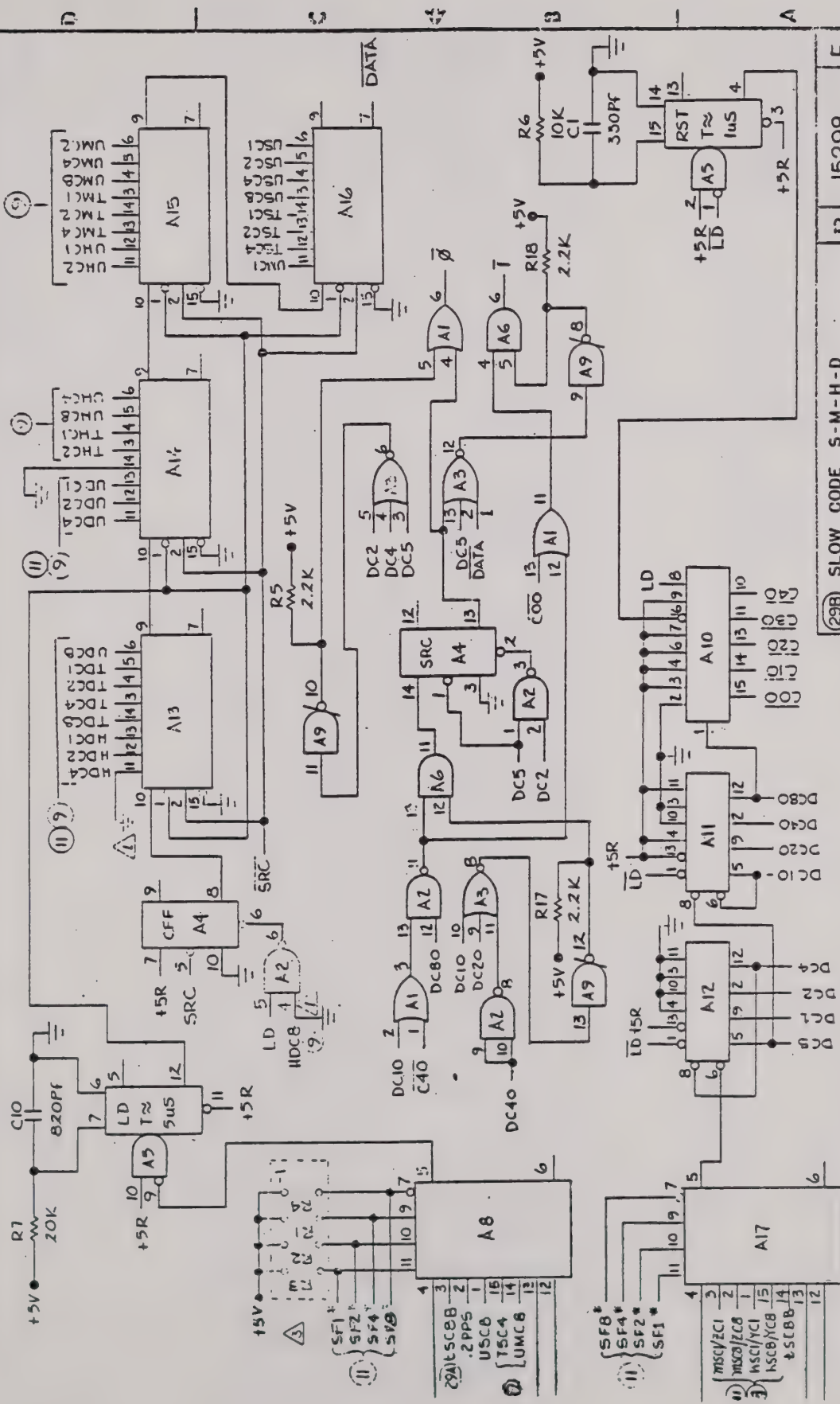
SLOW CODE		
(29A)	S-M-H-D	
MILES	1215/101	RM
RM	1215/101	RJ
ABOVE		
		1 of 3

Quantum Inc.
1001 R. STATE COLLEGE BLVD.
ANALYST, CALIFORNIA, 94704

NOTES:
CUT ETCH WHEN REQUIRED
IF CODE SELECT OPTION IS INSTALLED THIS TERM IS
SUFFIXED WITH (*) AND ORIGINATES ON (2)

USED WITH PCB 17174

5 4 3 2 1



1-1 ASSY ADD. R1, R2, R3 AND R4 15.6K.

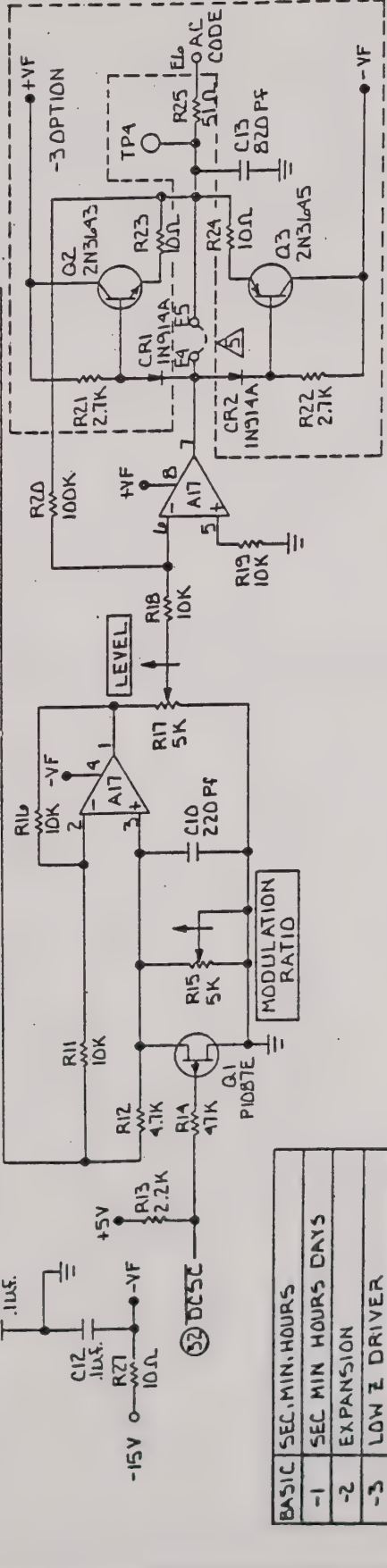
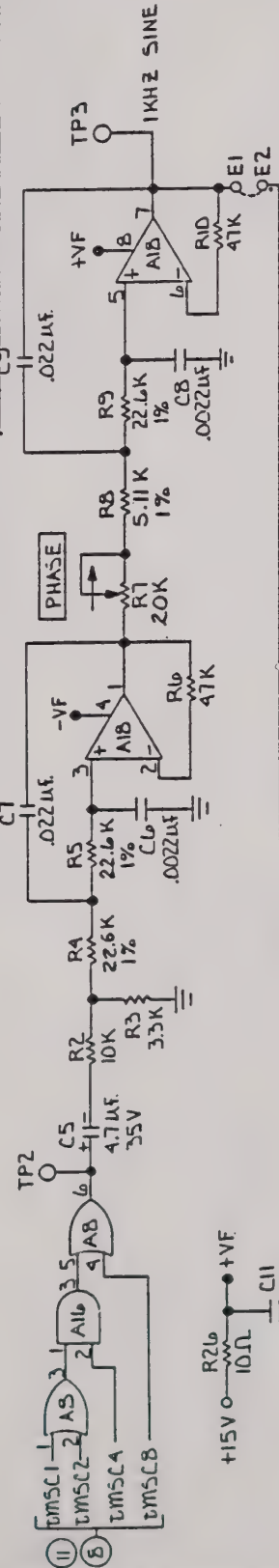
(29B) SLOW CODE S-M-H-D		B	15298	E
THIS UNIT IS PREPARED TO CARRY OUT A FULL 10% OF APPROVED USERS FOR ANY OTHER SERVICE PROVIDED BY CONTRACT				
		SHE 2 OF 3		REV.

2 3 4 5

IC 1A7 WAS 74107 PER ECOT4EE2 6-15-84 JC

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
A	R4 WAS 20.5K PER COM 2759	2-3-77	✓-H
-	ADDED (U) REF'S CFI-CF9CW-2	11-14-77	CC/KMH
B	REVISED PER C.O. #73755	5-31-79	LS/SRL
-	ADDED NOTE A	3-27-81	JC



BASIC	SEC.	MIN.	HOURS
-1	SEC	MIN	HOURS
-2	EXPANSION		
-3	LOW Z DRIVER		

- ⚠ GND WHEN C/F SCAN NOT USED
- ⚠ REMOVE JUMPER FROM E4-E5 WHEN -3 OPTION IS USED.
- ⚠ GROUND WHEN 17 BIT BINARY NOT USED.
- ⚠ GROUND PIN14 WHEN -2 OPTION IS NOT USED.
- ⚠ CUT ETCH AND GROUND PINS 12,15 WHEN DAYS OPTION IS NOT USED.

NOTES: UNLESS OTHERWISE SPECIFIED

N555BV	SIGNETICS	A17, A18
N74151N	T.I.	A9-15
SN74LS107H	TI	A7
N7432A	NATIONAL	A6, 8
N7411A		A5
N7408A		A1, A4, A10
N7400A	NATIONAL	A2, A3
PART NO.	MFR	REF. DES.

THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.			
TITLE			
IRIG B ENCODER			
Datum Inc. 1315 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92808			
DRAWN	KAIN	DES	
CHECK	QAL	ENGR	
SCALE	NONE	SEC	31160
SHEET	2	OF	2
REV			

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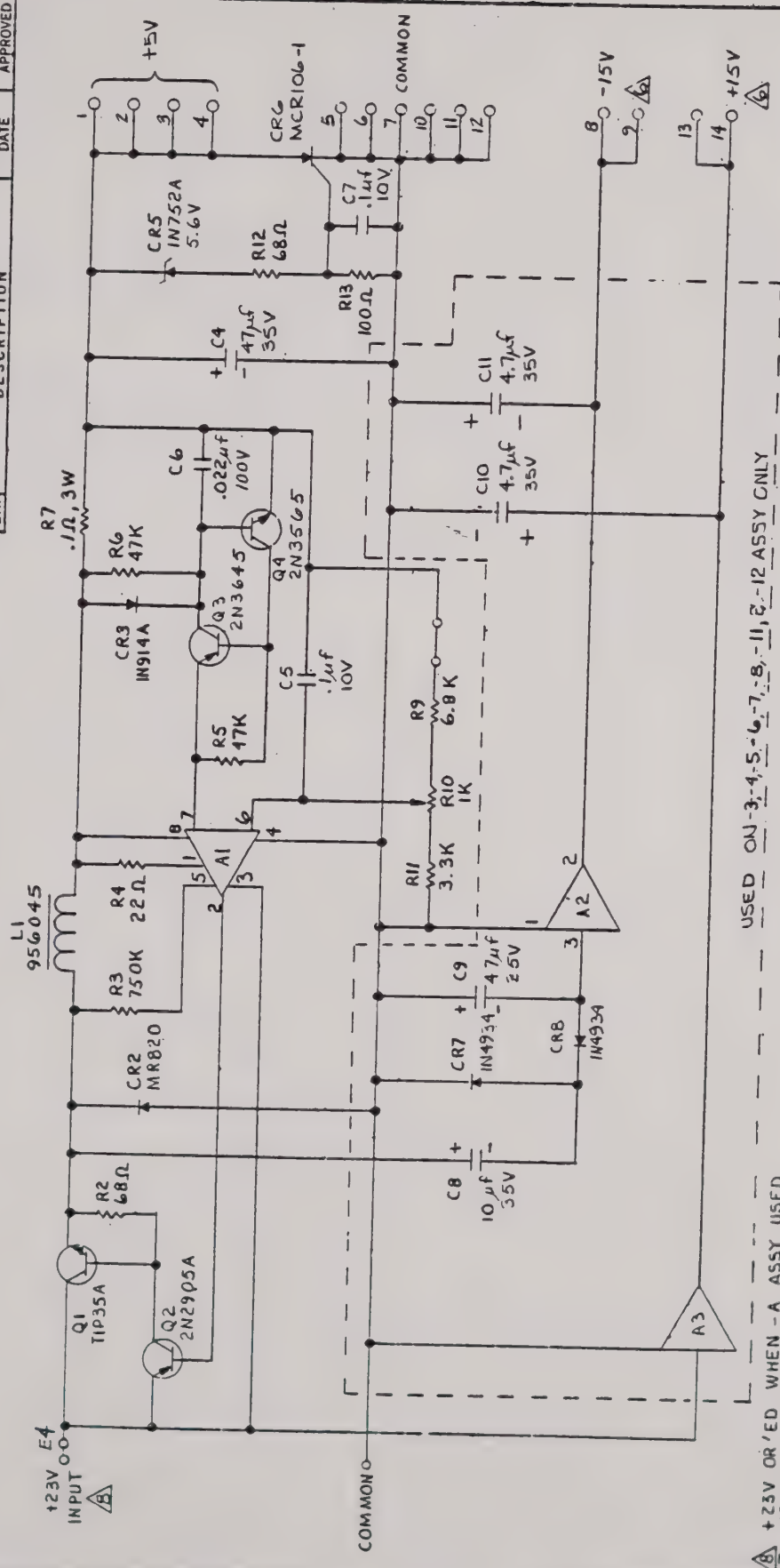
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REVISIONS		DATE	APPROVED
LTR	DESCRIPTION		



- 1. RESISTORS ARE 1/4 W, 5%
- 2. A1 IS LM305
- 3. A2 IS UGAT815393 OR MC7815CP
- 4. A3 IS UGAT815393 OR MC7815CP
- 5. -5 ASSY A3 IS 7808, A2 IS 79M08
- 10 ASSY A3 IS 7808, A2 IS 79M08
- 10 ASSY OUTPUT IS +12V -10 ASSY OUTPUT IS ± 8V
- 12. -H ASSY: CR51 IS VHI48; ADD HEAT SINK.
- 11. -15 ASSY: A2 IS LM7909CT, A3 IS LM7810CT
- 10. -12 ASSY: A2 IS 7915UC
- 9. -11 ASSY: A2 IS MC7912CP, A3 IS MC7812CP

NOTES: UNLESS OTHERWISE SPECIFIED

 Datam Inc. 1393 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92804		H 16280 B		H 2 2	
REGULATOR		31160		2	
Q1N Q2N Q3N Q4N Q5N Q6N Q7N Q8N Q9N Q10N Q11N Q12N Q13N Q14N Q15N Q16N Q17N Q18N Q19N Q20N Q21N Q22N Q23N Q24N Q25N Q26N Q27N Q28N Q29N Q30N Q31N Q32N Q33N Q34N Q35N Q36N Q37N Q38N Q39N Q40N Q41N Q42N Q43N Q44N Q45N Q46N Q47N Q48N Q49N Q50N Q51N Q52N Q53N Q54N Q55N Q56N Q57N Q58N Q59N Q60N Q61N Q62N Q63N Q64N Q65N Q66N Q67N Q68N Q69N Q70N Q71N Q72N Q73N Q74N Q75N Q76N Q77N Q78N Q79N Q80N Q81N Q82N Q83N Q84N Q85N Q86N Q87N Q88N Q89N Q90N Q91N Q92N Q93N Q94N Q95N Q96N Q97N Q98N Q99N Q100N	CR1 CR2 CR3 CR4 CR5 CR6 CR7 CR8 CR9 CR10 CR11 CR12 CR13 CR14 CR15 CR16 CR17 CR18 CR19 CR20 CR21 CR22 CR23 CR24 CR25 CR26 CR27 CR28 CR29 CR30 CR31 CR32 CR33 CR34 CR35 CR36 CR37 CR38 CR39 CR40 CR41 CR42 CR43 CR44 CR45 CR46 CR47 CR48 CR49 CR50 CR51 CR52 CR53 CR54 CR55 CR56 CR57 CR58 CR59 CR60 CR61 CR62 CR63 CR64 CR65 CR66 CR67 CR68 CR69 CR70 CR71 CR72 CR73 CR74 CR75 CR76 CR77 CR78 CR79 CR80 CR81 CR82 CR83 CR84 CR85 CR86 CR87 CR88 CR89 CR90 CR91 CR92 CR93 CR94 CR95 CR96 CR97 CR98 CR99 CR100	R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14 R15 R16 R17 R18 R19 R20 R21 R22 R23 R24 R25 R26 R27 R28 R29 R30 R31 R32 R33 R34 R35 R36 R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58 R59 R60 R61 R62 R63 R64 R65 R66 R67 R68 R69 R70 R71 R72 R73 R74 R75 R76 R77 R78 R79 R80 R81 R82 R83 R84 R85 R86 R87 R88 R89 R90 R91 R92 R93 R94 R95 R96 R97 R98 R99 R100	C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18 C19 C20 C21 C22 C23 C24 C25 C26 C27 C28 C29 C30 C31 C32 C33 C34 C35 C36 C37 C38 C39 C40 C41 C42 C43 C44 C45 C46 C47 C48 C49 C50 C51 C52 C53 C54 C55 C56 C57 C58 C59 C60 C61 C62 C63 C64 C65 C66 C67 C68 C69 C70 C71 C72 C73 C74 C75 C76 C77 C78 C79 C80 C81 C82 C83 C84 C85 C86 C87 C88 C89 C90 C91 C92 C93 C94 C95 C96 C97 C98 C99 C100	U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18 U19 U20 U21 U22 U23 U24 U25 U26 U27 U28 U29 U30 U31 U32 U33 U34 U35 U36 U37 U38 U39 U40 U41 U42 U43 U44 U45 U46 U47 U48 U49 U50 U51 U52 U53 U54 U55 U56 U57 U58 U59 U60 U61 U62 U63 U64 U65 U66 U67 U68 U69 U70 U71 U72 U73 U74 U75 U76 U77 U78 U79 U80 U81 U82 U83 U84 U85 U86 U87 U88 U89 U90 U91 U92 U93 U94 U95 U96 U97 U98 U99 U100	

DATE: 10-1-88

SECTION VIII
LIST OF MATERIALS

1. Time Code Generator/Translator	9300-722
2. Time Code Generator/Translator	9300-001
3. AGC	16085
4. IRIG Basic	16543-136
5. LED Display	16549-1
6. Slow Code	15298
7. IRIG B Encoder	16062-1
8. Power Supply	16280-3

9300-722
 TIME CODE GEN/TRANS
 REV: A ENGR: RE
 DATE: 02/08/89

DATUM INC.
 PARTS LIST

JOB NO: _____

QUANTITY: _____ PAGE: 1

STOCK

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM / STK/MFR
1 SK9100-1	SHIPPING KIT	1.00	EA DATUM
2 0226-0104-1	CAP: .1MF, 100V, 10%	STK 1.00	EA DATUM
3 1202-0102	SW: TOGGLE SPDT	STK 4.00	EA DATUM
4 1204-3903	SW: P/B SPST N/O	STK 10.00	EA DATUM
5 1206-5112-N	SW: ROTARY 1P 2-12P	STK 1.00	EA DATUM
6 1212-7606-1	SW: T/W 2P, BCD, 10P	STK 1.00	EA DATUM
7 1299-765G-1	SW: BAND HARDWARE	STK 1.00	EA DATUM
8 15298	SLOW CODE	STK 1.00	EA DATUM
9 16062-1	IRIG ENCODER	STK 1.00	EA DATUM
10 16085	AGC	STK 1.00	EA DATUM
11 16280-3	POWER SUPPLY	STK 1.00	EA DATUM
12 16543-136	IRIG BASIC (CONVERSION)	1.00	EA DATUM
13 16549-1	DISPLAY	STK 1.00	EA DATUM
14 1704-1002	CONN: BNC 1F	STK 2.00	EA DATUM
15 1704-1625-6R	CONN: 6 PINS	STK 1.00	EA DATUM
16 170979A	PC BOARD	STK 1.00	EA DATUM
17 1792-1855	CONTACT SOCKET	STK 6.00	EA DATUM
18 1795-0001	FLAT WASHER	STK 2.00	EA DATUM
19 1795-0002	SHOULDER WASHER	STK 2.00	EA DATUM
20 2524-5010	BLACK KNOB	STK 1.00	EA DATUM
21 700362	CENTER SUPPORT	STK 1.00	EA DATUM
22 700364-2	COVER	STK 2.00	EA DATUM
23 700546	STIFFENER	STK 5.00	EA DATUM
24 703335-1	BUTCH PLATE	STK 1.00	EA DATUM
25 703335-2	BUTCH PLATE	STK 1.00	EA DATUM
26 703336	CONN MTG PLATE	STK 1.00	EA DATUM
27 704757-2	SIDE GUSSET	STK 2.00	EA DATUM

9300-722
TIME CODE GEN/TRANS
REV: A ENGR: RE
DATE: 02/08/89

DATUM INC.
PARTS LIST

JOB NO: _____
QUANTITY: _____ PAGE: 2

STOCK

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
28 704899-1	REAR PANEL	STK 1.00	EA	DATUM
29 705850	FRONT PANEL	STK 1.00	EA	DATUM
30 705853	COVER PLATE	STK 1.00	EA	DATUM
31 705866-3	LENS #2423 RED	STK 1.00	EA	DATUM
32 707349-1	BUTCH PLATE	STK 1.00	EA	DATUM
33 914138	MTG BRACKET ASSEMBLY	STK 2.00	EA	DATUM
34 931500	HANDLE 1 3/4"	STK 2.00	EA	DATUM

END OF PARTS LIST FOR 9300-722

9300-001
TCG/T BASIC ASSY
REV: D ENGR: RE
DATE: 08/02/88

DATUM INC.
PARTS LIST

JOB NO: _____
QUANTITY: _____ PAGE: 1

STOCK

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
1 0226-0104-1	CAP: .1MF, 100V, 10%	STK	1.00 EA	DATUM
2 1202-0102	SW:TOGGLE SPDT	STK	4.00 EA	DATUM
3 1204-3903	SW:P/B SPST N/O	STK	10.00 EA	DATUM
4 1206-5112-N	SW:ROTARY 1P 2-12P	STK	1.00 EA	DATUM
5 1212-7606-1	SW:T/W 2P, BCD, 10P	STK	1.00 EA	DATUM
6 1299-765G-1	SW:BAND HARDWARE	STK	1.00 EA	DATUM
7 16062-1	IRIG ENCODER	STK	1.00 EA	DATUM
8 16085	AGC	STK	1.00 EA	DATUM
9 16280-3	POWER SUPPLY	STK	1.00 EA	DATUM
10 16543-16	IRIG BASIC	STK	1.00 EA	DATUM
11 16549-1	DISPLAY	STK	1.00 EA	DATUM
12 1704-1002	CONN:BNC 1F	STK	2.00 EA	DATUM
13 1704-1625-6R	CONN: 6 PINS	STK	1.00 EA	DATUM
14 170979A	PC BOARD	STK	1.00 EA	DATUM
15 1792-1855	CONTACT SOCKET	STK	6.00 EA	DATUM
16 1795-0001	FLAT WASHER	STK	2.00 EA	DATUM
17 1795-0002	SHOULDER WASHER	STK	2.00 EA	DATUM
18 2524-5010	BLACK KNOB	STK	1.00 EA	DATUM
19 700362	CENTER SUPPORT	STK	1.00 EA	DATUM
20 700364-2	COVER	STK	2.00 EA	DATUM
21 700546	STIFFENER	STK	3.00 EA	DATUM
22 704757-2	SIDE GUSSET	STK	2.00 EA	DATUM
23 704899-1	REAR PANEL	STK	1.00 EA	DATUM
24 705850	FRONT PANEL	STK	1.00 EA	DATUM
25 705853	COVER PLATE	STK	1.00 EA	DATUM
26 705866-3	LENS #2423 RED	STK	1.00 EA	DATUM
27 707349-1	BUTCH PLATE	STK	1.00 EA	DATUM

9300-001

DATUM INC.
PARTS LIST

JOB NO: _____

TCG/T BASIC ASSY

REV: D ENGR: RE

QUANTITY: _____ PAGE: 2

DATE: 08/02/88

STOCK

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
28 914138	MTG BRACKET ASSEMBLY	STK 2.00	EA	DATUM
29 931500	HANDLE 1 3/4"	STK 2.00	EA	DATUM

END OF PARTS LIST FOR 9300-001

16085

DATUM INC.
PARTS LIST

JOB NO: _____

AGC
REV: J ENGR: BH
DATE: 03/31/89

STOCK

QUANTITY: _____ PAGE: 2

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
18 0102-0682 R29	RES:6.8K, 1/4W, 5%	STK	1.00 EA	DATUM
19 0102-0752 R16	RES:7.5K, 1/4W, 5%	STK	1.00 EA	DATUM
20 0102-0753 R19	RES:75K, 1/4W, 5%	STK	1.00 EA	DATUM
21 0102-0910 R3	RES:91 OHM, 1/4W, 5%	STK	1.00 EA	DATUM
22 0104-0221 R48	RES:220 OHM, 1/2W 5%	STK	1.00 EA	DATUM
23 0220-0105 C15	CAP:1MF, 35V, 10% C16 C19 C2 C20 C21	STK	6.00 EA	DATUM
24 0220-0107 C14	CAP:100MF, 10V, 10%	STK	1.00 EA	DATUM
25 0220-0474 C4	CAP:.47MF, 35V, 10% C8	STK	2.00 EA	DATUM
26 0220-0475 C12	CAP:4.7MF, 35V, 10% C13 C17 C18 C3	STK	5.00 EA	DATUM
27 0221-0221 C11A	CAP:220MF, 10V, 10% C11B	STK	2.00 EA	DATUM
28 0225-0100 C23	CAP:10PF, 100V, 10%	STK	1.00 EA	DATUM
29 0225-0152 C10	CAP:1500PF, 100V 10%	STK	1.00 EA	DATUM
30 0225-0471 C22	CAP:470PF, 100V, 10%	STK	1.00 EA	DATUM
31 0226-0100 C6	CAP:10PF 500V 5%	STK	1.00 EA	DATUM
32 0226-0103-1 C7	CAP:.01MF 100V 10%	STK	1.00 EA	DATUM
33 0226-0104-1 C1	CAP:.1MF, 100V, 10%	STK	1.00 EA	DATUM
34 0226-0203 C5	CAP:.02MF 100V 20%	STK	1.00 EA	DATUM
35 0226-0470 C9	CAP:47PF 500V 5%	STK	1.00 EA	DATUM

16085
AGC
REV: J ENGR: BH
DATE: 03/31/89

DATUM INC.
PARTS LIST

JOB NO: _____
QUANTITY: _____ PAGE: 3

STOCK

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
36 0301-7405 A5	IC 7405	STK	1.00 EA	DATUM
37 0301-7749 A1	IC 749 A4	STK	2.00 EA	DATUM
38 0301-9311-H A2	IC 311H A3	STK	2.00 EA	DATUM
39 0500-0306 CR1	DIODE:1N914 CR3	STK	2.00 EA	DATUM
40 0515-0705-1 CR2	DIODE:1N705A	STK	1.00 EA	DATUM
41 0515-0752-1 CR4	DIODE:1N752A	STK	1.00 EA	DATUM
42 0550-7705 Q6	TRANS:2N3565	STK	1.00 EA	DATUM
43 0555-6600 Q7	TRANS:2N3645	STK	1.00 EA	DATUM
44 0570-1087 Q3	TRANS:P1087 Q4 Q5	STK	3.00 EA	DATUM
45 0570-8703 Q2	TRANS:988703	STK	1.00 EA	DATUM
46 0570-8704 Q1	TRANS:988704	STK	1.00 EA	DATUM
47 170574F	P.C. BOARD	STK	1.00 EA	DATUM
48 170785N/C	P.C. BOARD	STK	1.00 EA	DATUM
49 1708-3788 XA1	SOCKET:14 PINS XA4 XA5	STK	3.00 EA	DATUM
50 1708-8000 XA2	SOCKET:TD-5 CASE XA3	STK	2.00 EA	DATUM

END OF PARTS LIST FOR 16085

16543-136
IRIG BASIC (CONVERSION)
REV: F ENGR: EH
DATE: 02/08/89 PCCPY

DATUM INC.
PARTS LIST

JOB NO: _____
QUANTITY: _____ PAGE: 1

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
1 1301-0001 Y1	OSCILLATOR: 1 MHZ	STK	1.00 EA	DATUM
2 16543-16	IRIG BASIC	STK	1.00 EA	DATUM

NOTES:

CONVERSION FROM 16543-16 TO 16543-136

END OF PARTS LIST FOR 16543-136

16543-16
IRIG BASIC
REV: F ENGR: BH
DATE: 03/31/89

DATUM INC.
PARTS LIST

JOB NO: _____
QUANTITY: _____ PAGE: 1

STOCK

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
1 0102-0102 R4	RES:1K, 1/4W, 5%	STK	1.00 EA	DATUM
2 0102-0103 R2	RES:10K, 1/4W, 5%	STK	1.00 EA	DATUM
3 0102-0151 R3	RES:150 OHM 1/4W 5%	STK	1.00 EA	DATUM
4 0102-0512 R1	RES:5.1K, 1/4W, 5%	STK	1.00 EA	DATUM
5 0102-0562 R10	RES:5.6K, 1/4W, 5% R11 R9	STK	3.00 EA	DATUM
6 0126-R6K0 C6	RES:CHIP, 6K C8	STK	2.00 EA	DATUM
7 0220-0475 C14 C3	CAP:4.7MF, 35V, 10% C15 C16 C17 C22 C23	STK	7.00 EA	DATUM
8 0221-0685 C26	CAP:6.8MF, 35V, 10%	STK	1.00 EA	DATUM
9 0225-0221 C1	CAP:220PF, 100V, 10% C2	STK	2.00 EA	DATUM
10 0225-0330 C10	CAP:33PF, 100V, 10% C11 C12	STK	3.00 EA	DATUM
11 0225-0331 C13	CAP:330PF, 100V, 10% C9	STK	2.00 EA	DATUM
12 0226-0104 C18	CAP:.1MF 25V 20% C19 C20 C21 C24	STK	5.00 EA	DATUM
13 0301-7H03 F10	IC 74H103	STK	1.00 EA	DATUM
14 0301-7H06 D4	IC 74H106	STK	1.00 EA	DATUM
15 0301-7122 C11	IC 74122	STK	1.00 EA	DATUM
16 0301-7123 B11	IC 74123 D5	STK	2.00 EA	DATUM
17 0301-7156 C5	IC 74156 C7	STK	2.00 EA	DATUM

16543-16
IRIG BASIC
REV: F ENGR: BH
DATE: 03/31/89

DATUM INC.
PARTS LIST

JOB NO: _____
QUANTITY: _____ PAGE: 2

STOCK

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
18 0301-7157 C4	IC 74157 D7 E7	STK	3.00 EA	DATUM
19 0301-7176 E5	IC 74176 F4 F5 F6 F7	STK	5.00 EA	DATUM
20 0301-7177 C10	IC 74177 E11	STK	2.00 EA	DATUM
21 0301-7192 B10 B7	IC 74192 B2 B3 B4 B5 B6 B8 B9 E4	STK	10.00 EA	DATUM
22 0301-7194 C2	IC 74194	STK	1.00 EA	DATUM
23 0301-7400 A11	IC 7400 D10 D2	STK	3.00 EA	DATUM
24 0301-7404 D3	IC 7404	STK	1.00 EA	DATUM
25 0301-7408 D9	IC 7408 F8 F9	STK	3.00 EA	DATUM
26 0301-7410 D11	IC 7410	STK	1.00 EA	DATUM
27 0301-7411 C9	IC 7411	STK	1.00 EA	DATUM
28 0301-7425 E8	IC 7425	STK	1.00 EA	DATUM
29 0301-7432 D6	IC 7432	STK	1.00 EA	DATUM
30 0301-7442 E6	IC 7442	STK	1.00 EA	DATUM
31 0301-7473 E10	IC 7473	STK	1.00 EA	DATUM
32 0301-7474 E9	IC 7474 F11	STK	2.00 EA	DATUM
33 0301-7486 C3	IC 7486 D8	STK	2.00 EA	DATUM
34 0301-9374 A10 A7	IC 9374 A2 A3 A4 A5 A6 A8 A9	STK	9.00 EA	DATUM

16543-16
IRIG BASIC
REV: F ENGR: BH
DATE: 03/31/89

DATUM INC.
PARTS LIST

JOB NO: _____
QUANTITY: _____ PAGE: 3

STOCK

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
35 1708-3897	SOCKET:14 PINS	STK	27.00 EA	DATUM
	XA11 XC10 XC11 XC3 XC6 XC8			
	XC9 XD10 XD11 XD2 XD3 XD6			
	XD8 XD9 XE10 XE11 XE5 XE8			
	XE9 XF10 XF11 XF4 XF5 XF6			
	XF7 XF8 XF9			
36 1708-3898	SOCKET:16 PINS	STK	29.00 EA	DATUM
	XA10 XA2 XA3 XA4 XA5 XA6			
	XA7 XA8 XA9 XB10 XB11 XB2			
	XB3 XB4 XB5 XB6 XB7 XB8			
	XB9 XC2 XC4 XC5 XC7 XD4			
	XD5 XD7 XE4 XE6 XE7			
37 170969F	PC BOARD	STK	1.00 EA	DATUM
38 2310-1591-B	FASTENER:1/4"X4-40	STK	2.00 EA	DATUM

16549-1
DISPLAY
REV: ENGR: BH
DATE: 11/17/88

DATUM INC.
PARTS LIST

JOB NO: _____
QUANTITY: _____ PAGE: 1

STOCK

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
1 1708-0036	CONN: 36 PINS	STK	2.00 EA	DATUM
2 1708-3788-1	SOCKET: 14 PINS	STK	9.00 EA	DATUM
3 1709378	P.C. BOARD	STK	1.00 EA	DATUM
4 2205-0006	DISPLAY: 7-SEGMENTS	STK	9.00 EA	DATUM
DS1	DS2 DS3 DS4 DS5 DS6			
DS7	DS8 DS9			

NOTES:

1. REF.: A-16549 ASSEMBLY AID

END OF PARTS LIST FOR 16549-1

15298

DATUM INC.
PARTS LIST

JOB NO: _____

SLOW CODE

REV: E ENGR: LS

DATE: 10/29/87

QUANTITY: _____ PAGE: 1

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
1 0102-0102	RES:1K,1/4W,5% R19	STK	1.00 EA	DATUM
2 0102-0103	RES:10K,1/4W,5% R6	STK	1.00 EA	DATUM
3 0102-0203	RES:20K,1/4W,5% R7	STK	1.00 EA	DATUM
4 0102-0222	RES:2.2K,1/4W,5% R16 R17 R18 R5	STK	4.00 EA	DATUM
5 0102-0272	RES:2.7K 1/4W 5% R13 R14 R9	STK	3.00 EA	DATUM
6 0102-0471	RES:470 OHM 1/4W 5% R20	STK	1.00 EA	DATUM
7 0102-0562	RES:5.6K,1/4W,5% R10 R11 R8	STK	3.00 EA	DATUM
8 0108-0820	RES:82 OHM,2W,5% R15	STK	1.00 EA	DATUM
9 0154-1002	RES:PCT 10K 1T1/2W R12	STK	1.00 EA	DATUM
10 0212-0103	CAP:.01MF,100V,5% C7 C5	STK	2.00 EA	DATUM
11 0212-0104	CAP:.1MF,100V,5% C2 C4 C6	STK	3.00 EA	DATUM
12 0220-0475	CAP:4.7MF,35V,10% C3 C5 C8	STK	3.00 EA	DATUM
13 0225-0331	CAP:330PF,100V,10% C1	STK	1.00 EA	DATUM
14 0225-0821	CAP:820PF,100V,10% C10	STK	1.00 EA	DATUM
15 0226-0104	CAP:.1MF 25V 20% C11 C12 C13 C14	STK	4.00 EA	DATUM
16 0227-0101	CAP:100PF,300V,5% C15	STK	1.00 EA	DATUM
17 0301-LS96	IC 74LS96 A10	STK	1.00 EA	DATUM
18 0301-7LS7-3	IC 74LS73 A4	STK	1.00 EA	DATUM

15298

SLOW CODE

REV: E ENGR: LS

DATE: 10/29/87

DATUM INC.
PARTS LIST

JOB NO: _____

QUANTITY: _____ PAGE: 2

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
19 0301-7406	IC 7406 A9	1.00	EA	DATUM
20 0301-8292	IC 74LS196 A11 A12	2.00	EA	DATUM
21 0302-LS00	IC 74LS00 A2	1.00	EA	DATUM
22 0302-LS02	IC 74LS02 A7	1.00	EA	DATUM
23 0302-LS08	IC 74LS08 A6	1.00	EA	DATUM
24 0302-LS12-3	IC 74LS123 A5	1.00	EA	DATUM
25 0302-LS15-1	IC 74LS151 A17 AE	2.00	EA	DATUM
26 0302-LS16-5	IC 74LS165 A13 A14 A15 A16	4.00	EA	DATUM
27 0302-LS27	IC 74LS27 A3	1.00	EA	DATUM
28 0302-LS32	IC 74LS32 A1	1.00	EA	DATUM
29 0500-0116	DIODE::SG1930 CR5	1.00	EA	DATUM
30 0500-0306	DIODE:1N914 CR2 CR3	2.00	EA	DATUM
31 0515-0961-2	DIODE:1N961E CR1	1.00	EA	DATUM
32 0550-0520	TRANS:MJE520 Q5	1.00	EA	DATUM
33 0550-7700	TRANS:2N3643 Q2 Q4	2.00	EA	DATUM
34 0550-7705	TRANS:2N365 Q1 Q3	2.00	EA	DATUM
35 1708-3897	SOCKET: 14 PINS XA1 XA11 XA12 XA2 XA3 XA4 XA6 XA7 XA9	9.00	EA	DATUM

15298

SLOW CODE

REV: E ENGR: LS

DATE: 10/29/87

DATUM INC.
PARTS LIST

JOB NO: _____

QUANTITY: _____ PAGE: 3

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
36 1708-3898	SOCKET: 16 PINS XA10 XA13 XA14 XA15 XA16 XA17 XA5 XA8	8.00	EA	DATUM
37 1717748	PC BOARD	1.00	EA	DATUM

NOTES:

A-15298 ASSEMBLY AIC

END OF PARTS LIST FOR 15298

16062-1

IRIG ENCODER

REV: C ENGR: RE

DATE: 10/22/97

DATUM INC.
PARTS LIST

JOB NO: _____

QUANTITY: _____ PAGE: 1

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
1 0102-0100	RES:10 OHM,1/4W,5% R26 R27	2.00	EA	DATUM
2 0102-0103	RES:10K,1/4W,5% R11 R16 R18 R19 R2	5.00	EA	DATUM
3 0102-0104	RES:100K,1/4W,5% R20	1.00	EA	DATUM
4 0102-0222	RES:2.2K,1/4W,5% R1 R13	2.00	EA	DATUM
5 0102-0332	RES:3.3K,1/4W,5% R3	1.00	EA	DATUM
6 0102-0472	RES:4.7K,1/4W,5% R12	1.00	EA	DATUM
7 0102-0473	RES:47K,1/4W,5% R10 R14 R6	3.00	EA	DATUM
8 0102-0510	RES:51 OHM,1/4W,5% R25	1.00	EA	DATUM
9 0115-2262	RES:22.6K,1/4W,1% R4 R5 R9	3.00	EA	DATUM
10 0115-5111	RES:5.11K,1/4W,1% R8	1.00	EA	DATUM
11 0154-2002	RES:PCT 20K 1T 1/2W R7	1.00	EA	DATUM
12 0154-5001	RES:PCT 5K 1T 1/2W R15 R17	2.00	EA	DATUM
13 0201-0221	CAP:220PF 500V 5% C10	1.00	EA	DATUM
14 0212-0222	CAP:.0022MF,100V5% C6 C8	2.00	EA	DATUM
15 0212-0223	CAP:.0022MF,100V,5% C7 C9	2.00	EA	DATUM
16 0220-0475	CAP:4.7MF,35V,10% C1 C3 C5	3.00	EA	DATUM
17 0226-0104	CAP:.1MF 25V 20% C2 C4	2.00	EA	DATUM
18 0226-0104-1	CAP:.1MF,100V,10% C11 C12	2.00	EA	DATUM

16062-1
IRIG ENCODER
REV: C ENGR: RE
DATE: 10/22/87

DATUM INC.
PARTS LIST

JOB NO: _____
QUANTITY: _____ PAGE: 2

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
19 0301-5558	IC 1458 A17 A18	STK	2.00 EA	DATUM
20 0301-7151	IC 74151A A10 A11 A12 A13 A14 A15	STK	6.00 EA	DATUM
21 0301-7400	IC 7400 A2 A3	STK	2.00 EA	DATUM
22 0301-7408	IC 7408 A1 A16 A4	STK	3.00 EA	DATUM
23 0301-7411	IC 7411 A5	STK	1.00 EA	DATUM
24 0301-7432	IC 7432 A6 A8	STK	2.00 EA	DATUM
25 0302-LS 10-7	IC 74LS107 A7	STK	1.00 EA	DATUM
26 0570-1087	TRANS:P1087 Q1	STK	1.00 EA	DATUM
27 1705184	P.C. BOARD	STK	1.00 EA	DATUM
28 1706-2010	TERMINAL: 1/16"PCB TP1 TP2 TP3 TP4	STK	4.00 EA	DATUM
29 1708-2034	SOCKET:8 PINS	STK	2.00 EA	DATUM
30 1708-3897	SOCKET:14 PINS	STK	9.00 EA	DATUM
31 1708-3898	SOCKET:16 PINS	STK	6.00 EA	DATUM

END OF PARTS LIST FOR 16062-1

16260-3

DATUM INC.
PARTS LIST

JOB NO: _____

POWER SUPPLY

REV: H ENGR: BH

QUANTITY: _____ PAGE: 1

DATE: 08/02/88

STOCK

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
1 0102-0101 R13	RES:100 OHM 1/4W 5%	STK	1.00 EA	DATUM
2 0102-0220 R4	RES:22 OHM, 1/4W, 5%	STK	1.00 EA	DATUM
3 0102-0332 R11	RES:3.3K, 1/4W, 5%	STK	1.00 EA	DATUM
4 0102-0472 R1	RES:4.7K, 1/4W, 5%	STK	1.00 EA	DATUM
5 0102-0473 R5	RES:47K, 1/4W, 5% R6	STK	2.00 EA	DATUM
6 0102-0680 R12	RES:68 OHM, 1/4W, 5% R2	STK	2.00 EA	DATUM
7 0102-0682 R9	RES:6.8K, 1/4W, 5%	STK	1.00 EA	DATUM
8 0102-0754 R3	RES:750K, 1/4W, 5%	STK	1.00 EA	DATUM
9 0125-0R10 R7	RES:.1 OHM, 3W, 3%	STK	1.00 EA	DATUM
10 0154-1001 R10	RES:POT 1K 1T 1/2W	STK	1.00 EA	DATUM
11 0212-0223 C6	CAP:.022MF, 100V, 5%	STK	1.00 EA	DATUM
12 0219-0388 C1	CAP:5800MF, 40V	STK	1.00 EA	DATUM
13 0220-0106-1 C8	CAP:10MF, 35V, 10%	STK	1.00 EA	DATUM
14 0220-0475 C10	CAP:4.7MF, 35V, 10% C11	STK	2.00 EA	DATUM
15 0220-0476 C4	CAP:47MF, 35V, 10% C9	STK	2.00 EA	DATUM
16 0226-0103 C101	CAP:.01MF, 1KV, 20% C102	STK	2.00 EA	DATUM
17 0226-0104 C5	CAP:.1MF 25V 20% C7	STK	2.00 EA	DATUM
18 0301-7815 A3	IC 7815	STK	1.00 EA	DATUM

16280-3
POWER SUPPLY
REV: H ENGR: BH
DATE: 08/02/88

DATUM INC.
PARTS LIST

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QUANTITY: _____ PAGE: 2

STOCK

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
19 0301-7915 A2	IC 7915	STK	1.00 EA	DATUM
20 0301-9305 A1	IC 305	STK	1.00 EA	DATUM
21 0500-0306 CR3	DIODE:1N914	STK	1.00 EA	DATUM
22 0515-0752-1 CR5	DIODE:1N752A	STK	1.00 EA	DATUM
23 0540-0106-1 CR6	DIODE:MCR106-1	STK	1.00 EA	DATUM
24 0540-0447 CRS1	DIODE:VS447	STK	1.00 EA	DATUM
25 0540-0820 CR2	DIODE:MR820	STK	1.00 EA	DATUM
26 0540-4720-1 CR1	DIODE:MR501	STK	1.00 EA	DATUM
27 0540-4934 CR7	DIODE:1N4934 CR8	STK	2.00 EA	DATUM
28 0550-035A Q1	TRANS:TIP-35A	STK	1.00 EA	DATUM
29 0550-7705 Q4	TRANS:2N3565	STK	1.00 EA	DATUM
30 0555-6005 Q2	TRANS:2N2905A	STK	1.00 EA	DATUM
31 0555-6600 Q3	TRANS:2N3645	STK	1.00 EA	DATUM
32 0601-6045 L1	CHOKe:200 UH	STK	1.00 EA	DATUM
33 0601-6082 T1	TRANSFORMER:POWER	STK	1.00 EA	DATUM
34 0702-0010 F1	FUSE:1A S/B 3AG	STK	1.00 EA	DATUM
35 0750-0200 XF1	FUSE HOLDER 3AG	STK	1.00 EA	DATUM
36 1704-1061-1	CONN: 7A, 125V	STK	1.00 EA	DATUM

16280-3
POWER SUPPLY
REV: H ENGR: BH
DATE: 08/02/89

DATUM INC.
PARTS LIST

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QUANTITY: _____ PAGE: 3

STOCK

PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
37 1706-0033	EYELET:1/16"PCB XL1-A XL1-B	STK	2.00 EA	DATUM
38 170778E	PC BOARD	STK	1.00 EA	DATUM
39 170779C	PC BOARD	STK	1.00 EA	DATUM
40 1708-3897	SOCKET:14 PINS XA3	STK	1.00 EA	DATUM
41 1708-8000	SOCKET:TD-5 CASE XA1	STK	1.00 EA	DATUM
42 2310-1247-09	SPACER:#6X1/8 L1	STK	1.00 EA	DATUM
43 2325-1004	TOROID RETAINER L1	STK	1.00 EA	DATUM
44 704561	MOUNTING PLATE	STK	1.00 EA	DATUM
45 704562	P/S SIDE SUPPORT	STK	1.00 EA	DATUM
46 704966-1	TRANSFORMER BRACKET	STK	1.00 EA	DATUM
47 704966-2	TRANSFORMER BRACKET	STK	2.00 EA	DATUM
48 707350	HEAT SINK	STK	1.00 EA	DATUM

NOTES:

USE X1 EA P/N 120-4 TOROID RETAINER MFR:08289 (MFG STK) FOR "L1"
SEE ASSEMBLY AID #A-16280 (C SIZE)

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